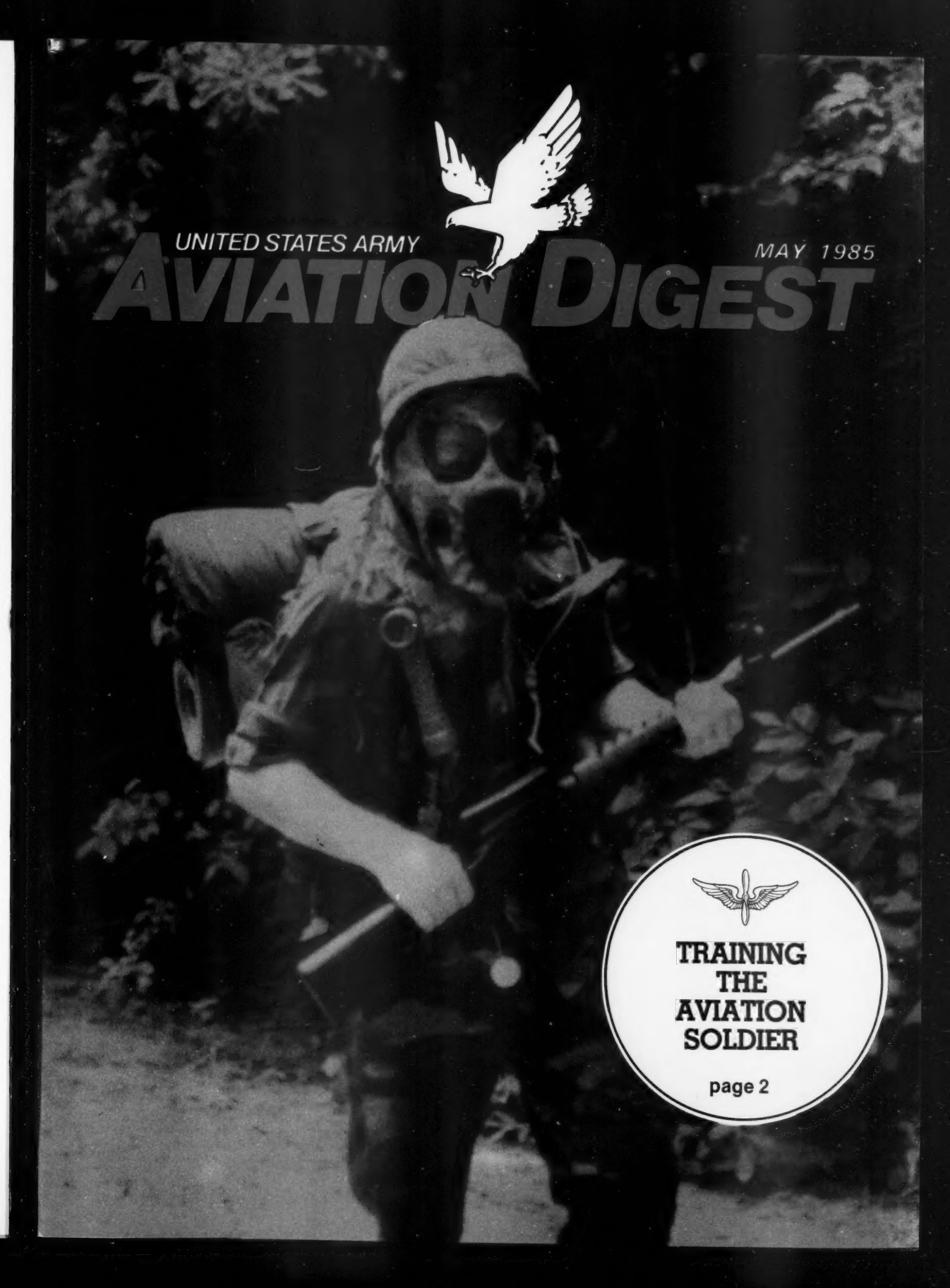


UNITED STATES ARMY

AVIATION DIGEST

MAY 1985

TRAINING THE AVIATION SOLDIER

page 2

MAY 1985 • VOLUME 31 • NUMBER 5

1 **Doctrinal and Training Publications,** MG Ellis D. Parker

2 **Training the Aviation Soldier,** CPT L.D. Walker

6 **ALSE Shop,** CW2 Erik P. Feldmanis

7 **Rationalization, Standardization, Interoperability,** Mr. Rush Wicker

9 **ERADCOM—Flight Test Activity,** CPT Greg Kaufmann

16 **Army Aviation Museum: AP-2E Neptune**

17 **Night Air Has Less Lift,** CW3 Thomas M. Flynn and CW3 Elliot M. Ser

18 **Joint Tactical Deception,** MAJ Bob Ashey, USAF

20 **PEARL'S**

22 **DES Report to the Field: ASTS/BTT Update**

24 **Aviation Personnel Notes: New Age Restrictions and Service Obligation For Flight School Attendance; Medical Disqualification Date Revised; Lieutenant Colonel Command Selection; Enlisted Update**

26 **TEAC Means Guaranteed Engine Performance,** MAJ Steven L. Ochsner

29 **VA to Z, Nailing the Numbers,** Mr. Barry Schiff

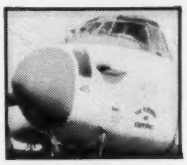
34 **Threat: Spetsnaz, The Hidden Enemy,** CPT Al Holder

38 **Kill or be Killed, Part III: The Tactical Threat Algorithm,** CW4 William Yarlett

44 **Views From Readers**

45 **ATC Action Line: Flying In and Out of Controlled Zones,** Mr. Robert C. Cole

page 9



page 16

page 18

page 34

page 38

Honorable John O. Marsh Jr.,
Secretary of the Army

Major General Ellis D. Parker
Commander, U.S. Army Aviation Center

Brigadier General Wayne C. Knudson
Army Aviation Officer, ODCSOPS

Brigadier General Rudolph Ostovich III
Assistant Commandant
U.S. Army Aviation Center

Richard K. Tierney
Editor

The mission of the *U.S. Army Aviation Digest* (USPS 415-350) is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, Aviation medicine and other related data.

The *Digest* is an official Department of the Army periodical published monthly under the supervision of the commander, U.S. Army Aviation Center. Views expressed herein are not necessarily those of the Department of the Army nor the U.S. Army Aviation Center. Photos are U.S. Army unless otherwise specified. Use of the masculine pronoun is intended to include both genders unless otherwise stated. Material may be reprinted provided credit is given to the *Aviation Digest* and to the author unless otherwise indicated.

Articles, photos, and items of interest on Army Aviation are invited. Direct communication is authorized by writing Editor, *U.S. Army Aviation Digest,* P.O. Drawer P, Fort Rucker, AL 36362-5000, or calling AUTOVON 558-6680, FTS 533-6680 or Commercial 205-255-6680. Manuscripts returned upon request.

Use of funds for printing of this publication has been approved by the Secretary of the Army, 19 January 1985, in accordance with Army Regulation 310-1. Second-class postage paid at Daleville, AL, and additional mailing offices.

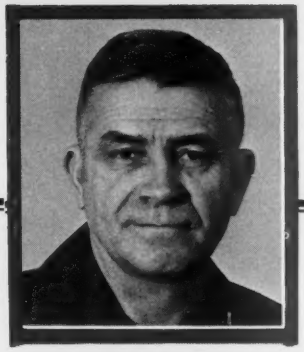
Active Army units receive distribution under the pinpoint distribution system as outlined, in AR 310-2. Complete DA Form 12-5-R and send directly to CDR, AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220. For any change in distribution requirements, initiate revised DA Form 12-5-R.

National Guard and Army Reserve units under pinpoint distribution also should submit DA Form 12-5-R. Other National Guard units should submit requests through their state adjutant general.

Those not eligible for official distribution or who desire personal copies of the *Digest* can order the magazine from the Superintendant of Documents, U.S. Government Printing Office, Washington, DC 20402.

POSTMASTER: Send address changes to Superintendant of Documents, U.S. Government Printing Office, Washington, DC, 20402.

Major General Ellis D. Parker
Chief, Army Aviation Branch



Doctrinal and Training Publications

BEFORE ARMY Aviation became its own branch, proponency for doctrine, like proponency for systems, was spread throughout the Army. As a result, doctrine and tactics for the employment of Aviation units had been neglected.

Another issue that faced all branches, but impacted especially heavily on the Aviation Branch, was that of an unprecedented force modernization, both in terms of organizational change and newly developed equipment and systems. The doctrine implications were there, but nothing had been done.

When we assumed doctrine responsibility, most doctrinal manuals were outdated, not in line with new organizational structuring, or existed in title only. Since becoming the proponent, we have assembled and analyzed all of the manuals with the intent of reducing their numbers drastically through consolidation and outright deletion, and with adding new ones, based on J-series organization.

We have also devised a new numbering system for our manuals. As you may have already noticed, all of the field manuals, training circulars and field circulars that have a series number 1-_____ are "Aviation" publications written and produced here at Ft. Rucker.

We have identified four major categories for all Aviation-related publications. Each category has its own distinctive numbering system, using 100-series increments to improve overall identification.

The first category, EMPLOYMENT, contains all of Army Aviation's doctrinal employment and how-to-fight manuals. The manuals listed in the EMPLOYMENT category are those which address Aviation employment subjects rather than technical flight-related tasks.

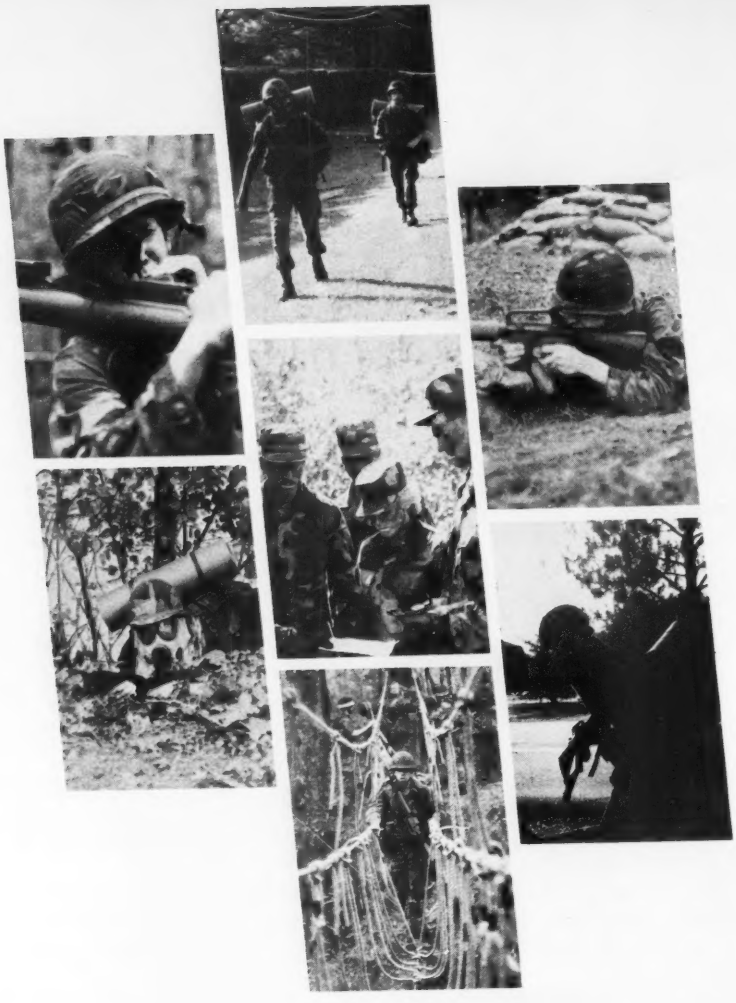
The second category, FLIGHT, is divided into five subcategories:

- *Techniques and Procedures* (flight subjects) Series 1-200 to 1-208.
- *Aircrew Training Manuals* (self-explanatory) Series 1-209 to 1-219.
- *Flight Handbooks* (instructor guides) Series 1-220 to 1-229.
- *Meteorology* (self-explanatory) Series 1-230 to 1-239.
- *Navigation* (instrument and visual) Series 1-240 to 1-249.

The third category, GENERAL SUBJECTS, pertains to all support subjects, such as aeromedical training for Aviation personnel and Aviation life support equipment.

The fourth category, HANDBOOKS, consists of pocket-size reference publications, which incorporate specific subjects addressed in any or all manuals listed in the other categories. Their purpose is to highlight the most important aspects of an Aviation library and to provide you with a handy reference. In this category, you will find one of our "best sellers," the "Aviator's Handbook" (FM 1-400).

All of our Aviation publications are being reviewed and revised continually to update doctrine, to improve readability, to ensure subject matter accuracy and to keep your interest. We're formulating an entirely new Aviation library concept to educate today's Army aviators for tomorrow's needs. Our goal is to write and to produce the most interesting and valuable doctrinal and training publications in the military. We will meet this goal!



TRAINING THE AVIATION SOLDIER

A TOTAL APPROACH

CPT. L.D. Walker
1st Aviation Brigade
U.S. Army Aviation Center
Fort Rucker, AL

Although training to become an Aviation soldier is demanding and challenging, it also has its rewards. The Aviation Advanced Individual Training Course is presented in two phases, both of which are focused primarily on producing the "total soldier." Upon successful completion of the soldierization training, outstanding and highly motivated students may be selected to attend the Air Assault School and may help Army recruiters in the Hometown Recruiter Assistance Program.

THE MOTTO "Above the Best" has been the centerpiece for excellence around which Aviation soldiers have historically rallied. In perpetuating professional excellence, the Aviation soldier has emerged as possibly the most technically proficient soldier in the Army.

He has demonstrated his expertise and reliability in Korea, Vietnam, and, most recently, in Grenada. As we look forward with great anticipation to the fielding of such technological marvels as the OH-58D/AHIP, which features the Army's first totally integrated cockpit and mast mounted sight system; the AH-64 Apache with its target acquisition designation and pilot's night vision systems; and the lightweight, reliable, and all-weather tactical microwave landing system, the Aviation soldier will doubtlessly prove his mastery once again.

The Aviation soldier is the total soldier. But, he arrives at this level of total balance and excellence only after months of arduous training. He starts, like everyone else, in basic training learning the fundamentals of being a soldier. Besides marching, saluting and marksmanship, he develops self-discipline and values consistent with those of the Army.

Upon graduation from basic training, he reports to the 4th Aviation Training Battalion, 1st Aviation Brigade (AASLT) at Ft. Rucker, AL, to attempt to become an Aviation soldier. He soon discovers that his first few weeks of advanced individual training (AIT) training are not that different than his last few weeks of basic training. Furthermore, he finds that the relationship that he shares with his training, advising and counseling noncommissioned officer is painfully similar to that he had with his drill sergeant while in basic. He turns in all civilian clothing, is restricted to the unit area and cannot use his privately owned vehicle (POV) if he has brought one. These are all privileges that must be earned by the soldier during Phase I of AIT Soldierization. He then receives countless inspections (class A, barracks, in-ranks), physical training, drill and ceremonies, and challenging academic classes on subjects such as the Army Maintenance Management System, Army publications, and forms and records. Phase I is both mentally and physically stressful; it requires all the self-discipline and motivation that the soldier can muster.

In Phase II of the soldierization program, he can earn passes, use of his POV, and the privilege to wear civilian clothing. During this phase, he is encouraged to participate in the Smart Troop Program, an extracur-

A mission-oriented protective posture at different levels is reinforced during all field training.

Field training is initiated by a 10-kilometer forced march at night.

Hands-on technical training is achieved even in a tactical environment.

NCOs continuously conduct classes on a wide variety of subjects.

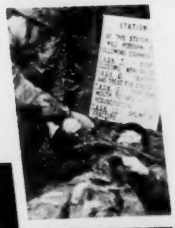
Soldiers cross streams using both single and triple rope bridges at night.

ricular academic pursuit that enhances technical capabilities and includes athletic and recreational events. Despite these newly found freedoms, they are considered privileges and may be revoked at any time should the soldier's behavior or performance become inconsistent with Army standards.

Throughout his demanding tenure in the battalion, he is constantly involved in activities that broaden him into a total soldier. He is repeatedly refreshed in the common tasks which he previously learned in basic and is tested on these tasks prior to his end of course field training exercise. The soldier is also involved with events that reinforce his drill and ceremonies and basic soldier skills such as funeral details and retirement reviews. Perhaps the most challenging and rewarding events are the team-building exercises conductd on Saturday mornings. These training activities are fast moving, daring, meaningful and build his self-confidence to unexpected levels. Among them are:

- Rappelling
- Drownproofing
- Orienteering
- Survival, escape, resistance and evasion training
- Air assault operations (raids, movement to contact, secure defend).

As the Aviation soldier nears the end of his training, he participates in a field training exercise that combines all tactical and technical skills that he has thus far learned. His field



Common task testing station showing first aid tasks (top), and nuclear, biological and chemical tasks (center and bottom).

A battalion chaplain provides counseling and guidance during a forced march water break.

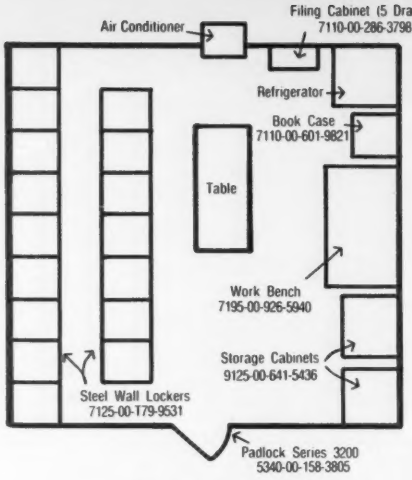
Soldiers return fire at the movement under direct fire testing station.

Erecting a tactical nondirectional beacon.

training commences at night with a 10-kilometer forced march complete with ambushes, nuclear, biological and chemical attacks and single rope bridge river crossings. At the conclusion of the forced march, he participates in a night hasty defensive operation while waiting to be airlifted the following morning to a landing site located in the division support command area. The remainder of the week is devoted to hands-on technical training in the tactical environment.

Upon the conclusion of this pluralistic field training, the soldier has achieved the technical and tactical proficiency of the total soldier, capable of taking his place as a member of the combined arms team. He is awarded a military occupational specialty in either the 67 or 93 career management field, is given Aviation Branch insignia for the first time and receives his aircrewman badge or air traffic control qualification. But the training experience is really not finished. Soldiers demonstrating motivation and excellence throughout the training program continue on to Air Assault School and the Hometown Recruiter Assistance Program.

The potential adversaries of the United States are highly trained and motivated. To confront them and be victorious requires that our soldiers be well trained in every aspect of modern warfare. They *must* be tactically and technically proficient. The Aviation soldier is the total soldier.



A L S E Shop

COMMANDERS AT all levels are responsible to provide Aviation life support equipment (ALSE) and related training commensurate with their missions and operational environments (AR 95-17, paragraph 1-4f). They also must establish and equip ALSE maintenance shops, staffed by qualified ALSE maintenance personnel on a full-time or part-time basis.

To meet this responsibility commanders need to understand the ALSE program and its requirements.

System Description

The Aviation Life Support System (ALSS) consists of components, techniques and training required to ensure aircrews and their passengers the best possible flight environment. Beyond providing for maximum functional capability of flying personnel through all environments experienced during normal missions, the ALSS also affords the means to enhance safe and reliable escape, descent, survival and recovery in combat and in emergency situations. To provide maximum support the commanders must have a well-designed ALSE shop tailored to their individual needs. The following is a basic outline/checklist for developing an ALSE shop.

General

The ALSE shop must provide adequate space for personal flight equipment, maintenance equipment, publications and a maintenance work area. (All ALSE equipment should be centrally located for inspections and accountability purposes.)

Size

The shop should be designed to maximize available space needed to guarantee a productive ALSE shop. The area of the shop depends on the amount of equipment required, which in turn depends on the number of crewmembers assigned. Granted, the more space available, the more comfortable the shop. However, a carefully designed, small shop can be as adequate and functional as a large one.

Shop Design

The first step in setting up the shop is to determine whether it will have a full-time or part-time ALSE technician. If a full-time technician is available, the shop can be set up based on the technician being present during duty hours to issue equipment. In this case a smaller shop would be sufficient to meet a unit's needs. If a part-time technician is to be used, consideration of a larger shop, depending on the number of crewmembers, may be desired to eliminate congestion within the area. After these considerations have been determined, design of the ALSE shop can begin.

Shop Set-Up

- Determine the area that is to be used as the ALSE shop.
- Select the proper storage cabinets/lockers. Storage cabinets require adequate space and arrangement to maintain spare parts and test equipment in a well organized manner.
- Determine the number of wall lockers or racks to be used for the crewmembers' personal flight equipment.
- Determine the type of equipment to be used in the maintenance area. It is recommended that if available, the shop be supplied with a refrigerator for battery storage and an air conditioner to cool the shop for the prevention of mildew from moisture during humid days. The ALSE shop temperature should be maintained at about 75 degrees Fahrenheit and 50 degrees relative humidity.
- Determine the size of the maintenance area desired. The maintenance area should have a work bench (wood top) with locking drawers and an ample number of electrical plug outlets. The bench needs to be large enough to give sufficient work space without crowding. A bookcase or shelf for required publications, to include Army regulations, maintenance manuals and other applicable publications, should be provided. If space is still available, a filing cabinet could be used for maintaining required files on messages, inspections, parts on order, inventory lists, serial numbers, etc.

The above drawing is an example of how an ALSE shop could be organized. Remember, each shop will vary depending on individual needs and resources available. The most effective ALSE shop is one that is designed for each individual unit's needs.

CW2 Erik P. Feldmanis
Directorate of Plans and Training
Aviation Division
Fort Knox, KY

Rationalization Standardization Interoperability

Rush Wicker
Directorate of Combat Developments
U.S. Army Aviation Center
Fort Rucker, AL

IN TODAY'S modern Army, RSI—rationalization, standardization and interoperability—has become a popular subject. Almost every project, no matter whether it be research and development or the employment of forces, seems to have some RSI impact. Unfortunately, many do not understand the implications of RSI. Part of this confusion can be found in the multitude of interpretations given to the term RSI.

Before addressing what is required to comply with RSI regulations, an understandable definition of RSI should be agreed upon. The regulation that governs RSI is AR 34-1. It describes rationalization as: "Any action that increases the effectiveness of alliance forces through more efficient or effective use of defense resources committed to the alliance. Rationalization includes consolidation, reassignments of national priorities to higher alliance needs, standardization, specialization, mutual support, improved interoperability or greater cooperation. Rationalization applies to both weapons/materiel resources and nonweapons military matters."

Rationalization is the most difficult and overlooked part of the RSI program. Normally, those working on RSI matters give the "R" lip service, turning quickly to hardware development or to services or supply matters. To the Army, rationalization produces the operational concepts; concepts which become the basis for joint development of tactics, hardware, services, procedures organizations or training systems. If concepts are not well thought out, then any attempt to achieve commonality is sure to fail.

The "S," **standardization,** is defined as: "The process by which nations achieve the closest practicable cooperation among forces, the most efficient use of research, development and production resources, and agree to adopt, in the broadest possible basis, use of:

- Common or compatible operational, administrative and logistics procedures.
- Common or compatible technical procedures and criteria.
- Common, compatible or interchangeable supplies, components, weapons or equipment.
- Common or compatible tactical doctrine with corresponding organizational compatibility."

The major element of standardization is the process of developing, producing, acquiring and using the same or common weapons or hardware and software procedures related thereto. This seems simple and straightforward. Unfortunately, there are hidden obstacles to prevent full standardization. National pride, economics, cultural differences, unemployment, industrial bases, national politics and national laws all complicate this issue. When, con-

GLOSSARY

ABCA	America, Britain, Canada and Australia
ASCC	Air Standardization Coordinating Committee
ATP	Allied Tactical Publications
MAS	Military Agency for Standardization
NATO	North Atlantic Treaty Organization
QSTAG	Quadripartite Standardization Agreements
QWG	Quadripartite Working Group
RSI	rationalization, standardization and interoperability
STANAG	standardization agreements
WP	working party

sidering these realities, it would appear that only the Soviet approach of mandatory standardization will work; however, among the free and democratic nations, where total standardization may not be likely, these obstacles must not be allowed to delay the achievement of an interoperable force among nations.

Interoperability is defined as: "The ability of systems, units, or forces to provide service to and accept service from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together."

Interoperability, by definition, deals with services that can be provided or accepted by member nations. In the opinion of many, interoperability is the most promising part of RSI, for often it can be obtained at little or no cost. For example, the common use of the 105 millimeter tank gun by many North Atlantic Treaty Organization (NATO) forces allows common ammunition servicing. One of the goals of an interoperable force is to achieve operational interoperability; the ability to use the firepower and the maneuver forces of each nation just as one would use those of one's own forces.

There are several organizations through which the United States develops agreements among nations. Within each alliance there are numerous working parties (WPs) responsible for a particular area of concern. Army Aviation related agreements are addressed in several WPs. The U. S. Army Aviation Center at Ft. Rucker, AL provides representation to the NATO Military Agency for Standardization (MAS), the Quadripartite Working Group (QWG), American, Britain, Canada and Australia (ABCA) Armies Standardization Program and the Air Standardization Coordinating Committee (ASCC). Within the MAS, standardization agreements, commonly referred to as STANAGs, are developed.

Member nations of MAS have agreed to incorporate STANAGs into their nation's training material and doctrinal publications. Another document that the MAS forums produce is allied tactical publications (ATP). These publications differ from STANAGs in that they contain much more detailed information. The ATP can be compared to the U. S. Army field manual. It is distributed directly to field units and schools for implementation into field exercises and programs of instruction.

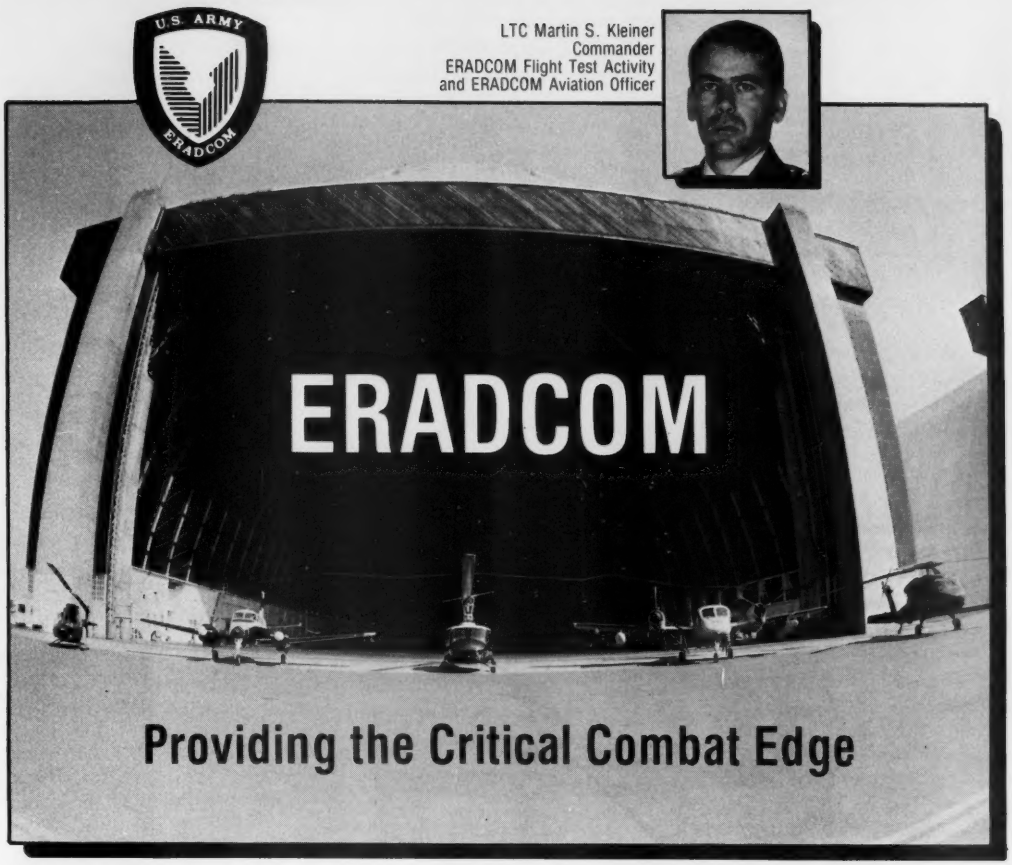
The QWG, which includes representation from ABCA, is responsible for the development of Quadripartite Standardization Agreements (QSTAGs) and concept papers. These publications address equipment needs and tactical doctrine.

The ASCC, which includes representation from America, Britain, Canada, Australia and New Zealand, is primarily air force oriented. The method used by this working party to achieve standardization is through agreements referred to as "air standards."

In addition to the development of standardization agreements by each of the forums, a continuous effort is made by the nations to share in the development of new equipment. Invitations to comment on materiel requirement documents are circulated to the nations for comment. Nations having an interest may request an equipment loan to determine its adaptability for their forces. Experience has shown that the sharing of materiel requirements, documents and items of equipment during the early development has improved the standardization/interoperability of equipment among nations.

Although not an easy task to develop and ratify a standardization agreement, about 52 aviation related agreements have been ratified and 23 drafts are being considered for ratification within the three forums. This commitment by the U. S Army necessitates that each of the U. S. Army Training and Doctrine Command centers abide by the terms of the agreement and incorporate the information into related publications. Such action will help ensure that academic instructors are teaching agreed upon doctrine and tactical units are employing this doctrine. Additionally, it will enable allied nations to operate as a unified force when joint operations are being conducted.

In view of this relative importance of RSI, the *Aviation Digest* periodically will carry an RSI report.



LTC Martin S. Kleiner
Commander
ERADCOM Flight Test Activity
and ERADCOM Aviation Officer

photos by U.S. Navy photographers at Lakehurst, NJ.

Flight Test Activity: Validating Concepts Throughout Development

Captain Greg Kaufmann
Plans and Training Officer
ERADCOM Flight Test Activity
Lakehurst, NJ

EFTA's mission includes evaluation of new technologies applicable to Army Aviation. The Flight Test Activity is located at the Naval Air Engineer Center in Lakehurst, NJ, and a detachment is at Davison AAF, Ft. Belvoir, VA. Pictured above are some of the major aircraft in EFTA's inventory. EFTA operated out of this Navy blimp hangar until the early 1960s. The hangar is 1,100 feet long, 300 feet wide and 211 feet high.

AS NOTED LAST month, the Electronics Research and Development Command (ERADCOM) is composed of numerous laboratories charged with the development of new systems to enhance the combat capabilities of the Army.

Often, these new systems are developed using the newest technologies and capabilities within the respective spheres of research for which each laboratory is responsible. These new technologies are sometimes not proven for Army applications. When this is the case, concept exploration is required through laboratory, or breadboard-level experimental prototypes. When these protypes are of an Aviation-related nature, the ERADCOM Flight Test Activity (EFTA) is called upon.

EFTA is an Aviation research and development (R&D) activity which operates at the concept exploration level of the materiel acquisition process. LTC Martin S. Kleiner, commander, EFTA, amplifies on his mission further: "Our job basically is to be available to the engineers on a 'walk in' basis. As they refine concepts they have in mind, they can come to us and ask, 'Will it work?' Remember, the items they bring to us are experimental in nature and are used to determine feasibility and to develop technical data. At this stage, the item is configured only to demonstrate the technical principles of immediate interest."

EFTA is the primary U. S. Army Materiel Command organization that provides the technical expertise for planning and executing aircraft modifications to accept prototypes of electronic airborne systems. EFTA is also responsible for assistance in planning and then conducting the R&D flight testing of these same systems for both rotary and fixed wing applications.

EFTA has been in existence since at least 1918, and has had other organizational designations (see page 12). After numerous moves and name changes, EFTA now finds itself located at the Naval Air Engineer Center in Lakehurst, NJ. Along with the EFTA Flight Test Detachment located at Davison AAF, Ft. Belvoir, VA, EFTA provides technical expertise for:

- Required aircraft modifications
- Human factors engineering advice
- Plans and conduct of flight testing of electronic airborne R&D systems
- Development of pilot training curricula for certain low density electronic airborne systems
- Conduct of initial and recurrent pilot training for major Army commands and service schools on certain systems once they are fielded.

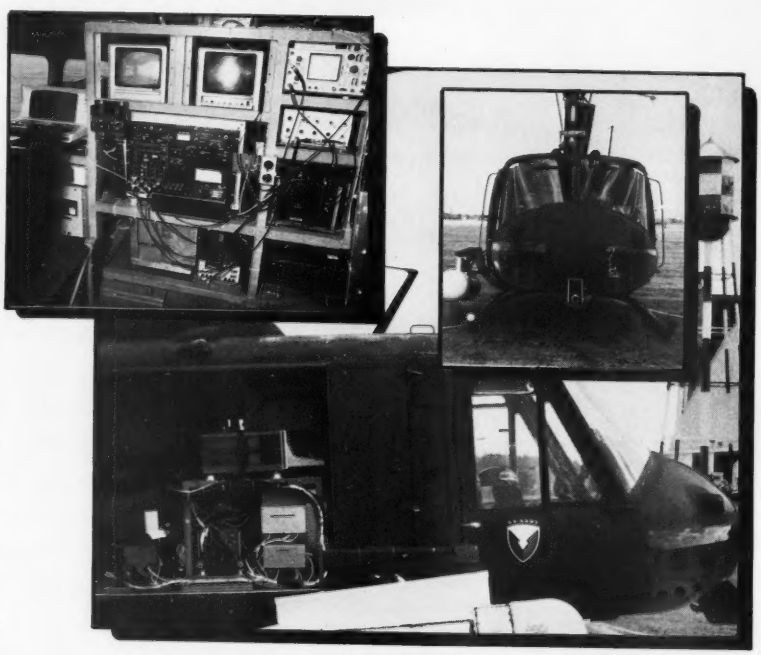
Systems tested include:

- Electronic countermeasures/electronic warfare support measures
- Voice

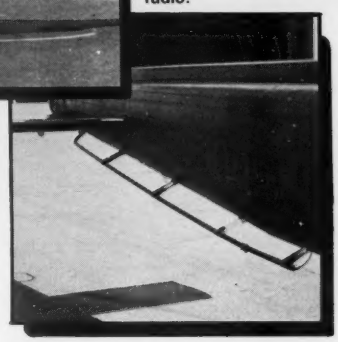
This UH-1H flew at the maximum gross weight of 9,500 pounds while conducting flight tests of a new millimeter wave radar system. This new system should lead to improved capabilities for terrain flight navigation, especially nap-of-the-earth.

The special TV camera for low light levels and the millimeter wave radar pod were two external modifications performed to this aircraft.

A special rack was installed with test, diagnostic and data recording equipment for the millimeter wave radar test. Views from both the radar and the TV camera were displayed on the two monitors at top center.



An improved high frequency antenna (below) recently tested and now being used to help test the AN/ARC-199 HF nap-of-the-earth communications radio.



This YEH-60B "Daddy Longlegs" which was originally used for the SOTAS program, and now is being used to test the AN/ASN-132 Integrated Inertial Navigation System for incorporation into the EH-60 QUICKFIX aircraft.

- Data and noncommunications emitters (avionics)
- Electro-optics
- Lasers
- Sensors
- Fuzes
- Searchlights
- Night vision devices.

In addition to publicized works, classified projects are conducted on a regular basis.

To support such varied and numerous requirements, EFTA maintains a fleet of both fixed and rotary wing aircraft. The inventory fluctuates with test requirements, but ranges from an 0-2 through and RV-1D and from an NUH-1B with autopilot and Microwave Landing System installations to the YEA-60B Standoff Target Acquisition System (SOTAS) "Daddy Longlegs." To successfully conduct such a varied operation, EFTA employs 30 military, 29 Department of the Army Civilians (DACs) and 75 maintenance contractor personnel.

The 13 DAC aviators provide stability, institutional continuity and extensive Aviation expertise. LTC Kleiner's trust in these pilots is reflected in his attitude toward them: "My DAC pilots are the very core of this activity. They represent significant levels of Aviation experience — both military and civilian. With the military background they have, they are better able to assist the engineers in achieving the goal of providing equipment which is useful to, and usable by, the aviator or soldier in the field."

The DAC pilots have a long association with Army Aviation. All have served in the Active Army, and the majority of them continue this association through the National Guard; three are retirees and only one lacks Vietnam experience. This long standing relationship has paid large dividends. For example, the project pilot assigned to the GUARDRAIL program has been involved in the development, testing and fielding of *all* the GUARDRAIL systems. This includes the actual use of the original GUARDRAIL concept (LAFFING EAGLE) under combat conditions in Vietnam. The individual has an institutional knowledge that cannot be found anywhere else. He can address any facet of the R&D process, understands the flight test profiles to be flown and understands the significance of deviation from these profiles.

It is important to recognize that EFTA itself does not institute research into new systems. Rather, engineers bring their concepts for future systems to EFTA. These engineers are helped to transform their ideas into reality when EFTA:

- Plans the required installations
- Performs the necessary modifications to the aircraft
- Plans and conducts the flight testing of the conceptual model *prior to* developmental and operational (DT/OT) testing.

MAJ Ed Cantwell, chief, Plans, Training and Operations Branch, acts as the interface with the engineers when they bring their requirements to EFTA: "Preparation to conduct the flight test of a project is perhaps the most lengthy portion of the entire process. Delineation of goals to be accomplished, identification of an aircraft and required modifications, ascertaining safety considerations, selection of project pilots with appropriate experience and background, and development of the flight test profiles — all of this preparation to fly what could be as little as 5 hours."

Once the conceptual model is proven, EFTA works hand-in-hand with the engineers to develop flight test plans, profiles and parameters, as well as to provide associated information on Aviation related areas such as human factors engineering and aircraft performance limitations. In most cases, EFTA project pilots become the subject matter experts and often remain involved with a product throughout the research, develop-

The History of the ERADCOM Flight Test Activity

1918

LT Donald B. McDonald reports to Camp Alfred Vail, NJ, on 17 January (present-day Ft. Monmouth). He is assigned to supervise the construction of flying fields and hangars to support the newly created Radio Laboratories.

504th Aero Squadron (Service) assigned to the Radio Laboratories on 4 February.

Radio Laboratories inaugurated. Work begins on 23 February on the development of air and ground communications.

In March six Curtiss JN4-D Jennies arrive at Ft. Monmouth.

122 Aero Squadron (Service) assigned to the Radio Laboratories on 29 March. Mission is to operate and maintain the aircraft in support of development work.

In April the 504th transferred to Langley Field, VA.

In May the first project test flight flown concerning direction finding by radio. 122 at a strength of 2 officers and 150 enlisted men.

The six Jennies are averaging 90 to 95 flights per week by the end of June.

A special test is conducted in July under the auspices of the Allied Expeditionary Forces entailing 55 flight hours.

Aircraft inventory up to 20 aircraft (four different models). Personnel strength in September was now 5 officers and 167 enlisted men.

In November 122d detached from the Radio Laboratories for embarkation to Europe. Air Service Detachment of 1 officer and 100 enlisted men formed to continue work with the laboratories.

1920 — 1941

By the early 1920s, three kinds of airborne radio equipment had been categorized—communications, navigation and meteorology. Development and test of the first two were at McCook Field, OH (later to become part of Wright Field); development and test of meteorological equipment remained at Ft. Monmouth. In the late 1920s, a miniaturized weather station with transmitter was designed to go aloft in balloons.

The Signal Corps Liaison Activity, which had been established at McCook Field in 1922, became their Aircraft Radio Laboratory in 1930, and portended the future creation of the USAF.

In 1935, a reorganization between the Air Corps and the Signal Corps consolidated all developmental work in air communications and air navigation at the Aircraft Radio Lab. There

ment, test and evaluation (RDTE) cycle and into the initial stages of fielding to units.

The single best example of this capability is EFTA's continuing involvement in the SOTAS program. EFTA has been involved with SOTAS since the first meeting was conducted in the late 1960s. The same chief project pilot, Mr. Jack Morrissey, has been associated with SOTAS from that first meeting to the present day. This individual was not only involved in the basic flight testing, calibration and verification of the system, but was responsible for ancillary items such as development of the pilot's operating handbook and system peculiar emergency procedures. Mr. Morrissey, who was already a UH-1 and UH-60 standardization instructor pilot (SIP), also became the Army's first SOTAS SIP. His involvement continues today as he returns to Germany regularly to administer recurrent training to the SOTAS detachments there. A maintenance team from EFTA also accompanies him to conduct maintenance training on the system.

In addition to the training aspect, actual work is accomplished by EFTA on the system on an as needed basis. New tactical air navigation (TACAN) systems were obtained for the SOTAS aircraft and that required new wiring harnesses to be fabricated and installed. EFTA sent a maintenance team to Germany to accomplish this work. EFTA currently is working with PM JSTARS to obtain and install an improved four-axis autopilot system for the aircraft. This project best exemplifies the entire range of capabilities that reside within EFTA.

The Special Electronic Mission Aircraft (SEMA) Product Manager is supported by EFTA to a large degree. Due to EFTA's mission, direct contributions to all aspects of SEMA systems as they exist today, and are projected to exist through the year 2000, have been accomplished by EFTA. All versions of the GUARDRAIL (except Improved GUARDRAIL V), QUICKFIX and QUICKLOOK systems have been initially flown and tested by EFTA pilots. Involvement continues today in various facets of these systems. Aside from the actual piloting of the aircraft and use of the system, the pilots' experience and knowledge are often called upon in an advisory capacity. Examples include the presence of an EFTA DAC pilot on both the GUARDRAIL System Design Group and the JSTARS Control Display Working Group.

A question which continually arises about EFTA is the extent of flight testing which is performed. EFTA does not perform any testing of an aerodynamic nature. This is the purview of the Aviation Engineering Flight Activity located at Edwards AFB, CA. However, EFTA's project aircraft are highly modified at times. The modifications to the aircraft can be both internal, i.e., the electrical system, or external, as in the case of mounting an experimental antenna or the like. CPT Jon Hall, chief, Maintenance and Supply Branch, observes: "Our contract maintenance personnel are highly experienced as evidenced by the amount of depot level work we perform. Many have military backgrounds. This enables us to perform just about any maintenance task necessary to prepare an aircraft to accept a prototype item for testing, or to repair an aircraft during the

followed significant developments in blind flying instruments and the evolvement of the ground controlled approach instrument landing system. In 1935, radar made its first appearance as well as the first push-button frequency selector high frequency radio for aviation applications.

In the late 1930s, the Signal Corps Laboratories at Ft. Monmouth invented the frequency-modulated (FM) radio.

This laboratory continued to drift away from Signal Corps influence until 1944, when the U.S. high command directed the Signal Corps to surrender to the insistent Army Air Forces control over all the electronics that were judged "peculiar to the AAF." However, the Signal Corps at Ft. Monmouth continued its interest in airborne electronics.

While no direct references are made to an aviation organization throughout this time period, there were four aircraft present at Ft. Monmouth in 1941 although they were not formally organized under one unit designation.

1941 — 1952

Organized as the Army Aviation Section with four aircraft and eight personnel.

1952 — 1954

Reorganized as the Signal Corps Aviation Center (SCAC) in support of the Signal Corps Engineering Laboratory, the Signal Corps Board, the Electronic Warfare Center and the Signal School. Assisted the Signal Corps Board in its worldwide responsibility for the development, procurement, storage, issue and maintenance of Army Aviation communication and navigation equipment, and the meteorological and aerial photography needs of Army aircraft.

1954 — 1963

SCAC was deactivated in 1954 when the Electronic Warfare Center and selected support organizations were transferred to Ft. Huachuca, AZ, so as to have increased space for its work. Reorganized as the Signal Research and Development Center Army Aviation Section.

1963 — 1978

Reorganized as the Electronics Command (ECOM) Army Aviation Detachment in 1963. ECOM consisted of seven R&D laboratories, most notably the Avionics Laboratory.

1978 — 1985

Reorganized as the Electronics Research and Development Command Flight Test Activity in 1978. Has remained under this designation to the present.

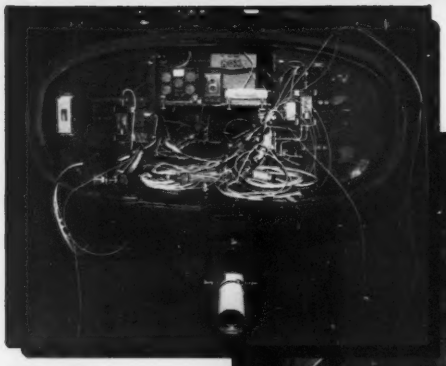
conduct of a test. Then, our quality assurance personnel, who are DACs, inspect the work to ensure that the work performed is safe, professional and up to standards."

In all cases, appropriate airworthiness releases are obtained from the Aviation Systems Command (AVSCOM) prior to any flight tests being performed. The maintenance capabilities of EFTA in the R&D field are noteworthy. Aircraft maintenance work can be performed at all levels. This includes depot level work when necessary and authorized for a project. The prime example of this capability is the work being performed on the system testbed for avionics research, a JUH-60A. The entire electrical, wiring and instrument systems were replaced during the past year to allow the installation of a computerized control system. Also, electromagnetic interference and electromagnetic compatability testing is accomplished here.

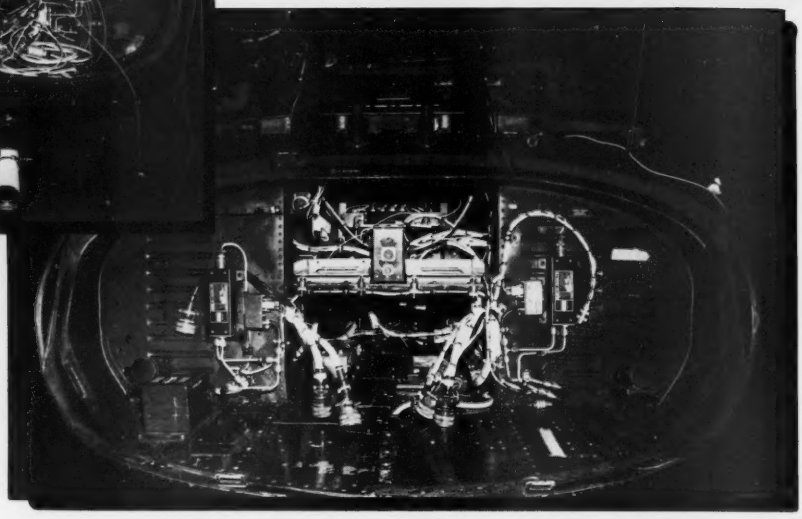
The maintenance branch has significant reponsibilities outside of the R&D arena, however. EFTA performs the Department of the Army regional Aviation intermediate maintenance under an intraservice support agreement in support of U.S. Army Forces Command, U.S. Army Training and Doctrine Command, West Point and other organizations. This involves supporting about 155 aircraft. EFTA also is the depot-level maintenance facility for the URC-102 radio system. Also, the entire Army fleet of T-42s has undergone a depot level upgrade of avionics. The last T-42 is currently undergoing this upgrade. All of the work was performed by EFTA.

Even though EFTA's primary place in the R&D cycle is at the experimental prototype level, EFTA pilots are regularly requested by the project engineers to fly the DT and/or OT tests. Two recently concluded examples of involvement in the DT test are the Global Positioning System and the AN/ASN-132 Integrated Inertial Navigation System. The OT follow-on evaluation tests were piloted by EFTA in the case of the AN/ASN-132. Additionally, a recent trend in acquisition methodology has had an influence on EFTA's operations. Nondevelopmental item (NDI) acquisition often finds EFTA testing off-the-shelf items for rapid incorporation into military aircraft. The Singer SKD-2110 Doppler Navigation System and the testing of two commercial TACANs for use in the OV/RV-1 are examples of this acquisition methodology. The performance of this work could cause some misunderstanding among other testers—a misunderstanding LTC Kleiner wants to avoid: "Army Aviation has an established testing cycle. While I am personally concerned about the period of time it takes from concept to fielding, as well as the probable duplication of effort within this cycle, EFTA does not conduct this testing [DT/OT] independently. We provide support with aircraft, pilots and maintenance when requested. The DT/OT testing is still performed under the purview of the appropriate agency."

LTC Kleiner continued: "This should show that EFTA is not strictly confined to servicing ERADCOM organizations. We are a customer oriented activity. We support anyone who needs our services. As a matter of fact, our



BEFORE

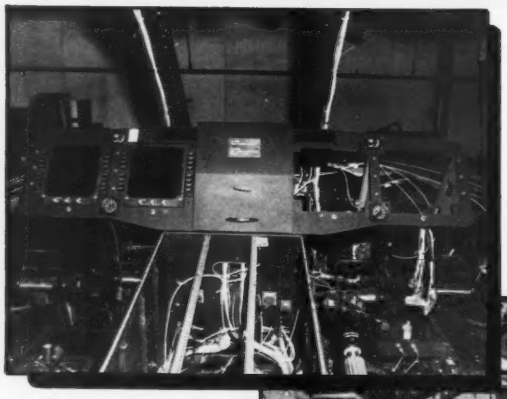


AFTER

Depot level work was performed on the JUH-60 System Testbed for Avionics Research (STAR). The aircraft was gutted of its electrical wiring and instrumentation to allow the installation of the Army Digital Avionics System (ADAS).

Before and after shots of electrical work performed in the nose section of the STAR are shown above. The low light level TV camera can be seen in the front of the aircraft.

The photo at left shows two of the CRTs that will be used to transmit all flight data to the pilots. The views from the TV camera also will be displayed here. Emergency backup pitot static instruments are under the cover in the center of the panel. This work took well over a year to complete.



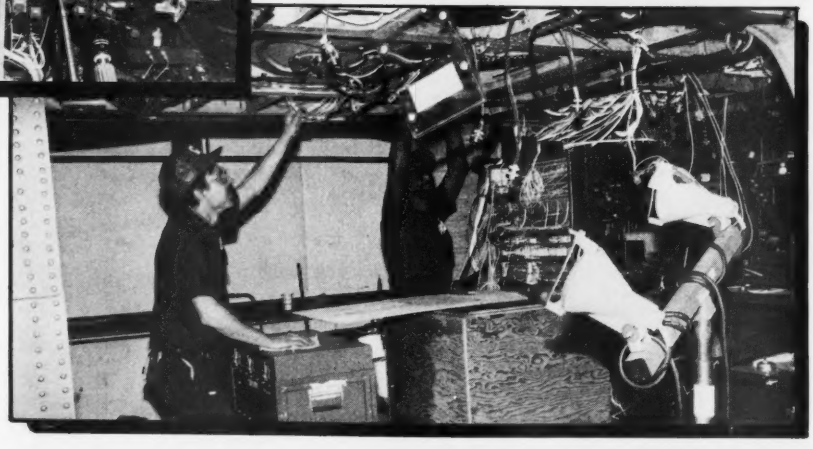
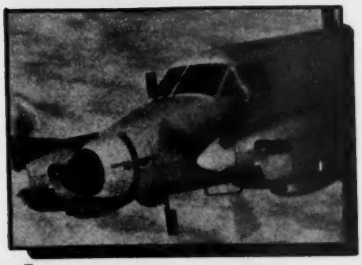


photo courtesy of Beech Aircraft



An RU-21H with the GUARDRAIL V system installed.

largest customer is not even an ERADCOM unit. It is the Avionics Research and Development Activity located at Ft. Monmouth, an AVSCOM activity. I would reiterate again that we exist to support the entire Army community, especially those U.S. Army Materiel Command R&D organizations oriented toward airborne electronic systems."

Yet, being the commander of EFTA brings with it another responsibility — being the ERADCOM Aviation Officer. "It is certainly a challenge wearing both of these hats. While the good of EFTA is always in my mind, there are times when that conflicts with the good of ERADCOM. One area, as an example, that sometimes conflicts is providing support to a laboratory that is located out West. They may need only 3 or 5 flight hours, and due to the costs involved, we have to coordinate for them to receive support from an Aviation unit in their vicinity. While I dislike losing business—just as any commander does—I also recognize that economical considerations are important in this day and age. So wearing two hats such I do helps to ensure that a proper perspective is brought to bear on all aspects of my operations."

There is an air of expectancy pervading EFTA these days as it looks excitedly to the future. Systems being designed for Army 21 and the AirLand Battle are now coming off of the drawing boards and are moving into the R&D phase. This feeling is reflected in LTC Kleiner's enthusiasm: "We are very excited as we start to visualize the business heading our way over the next 18 to 24 months. The R&D business is cyclic. Our flying hours in the late seventies and early eighties were high. We were flying projects such as CEFLY LANCER, GUARDRAIL, QUICKLOOK, QUICKFIX and SOTAS. These systems are now being fielded and we are not flying any major projects, so our flying hour program has dropped. But the ground time on our project aircraft has increased immensely as new systems being readied for flight testing are installed and ground tested. Right now, I have four aircraft that have been grounded for a year or more as projects are installed. So we see our flying hours will be starting to increase in another year.

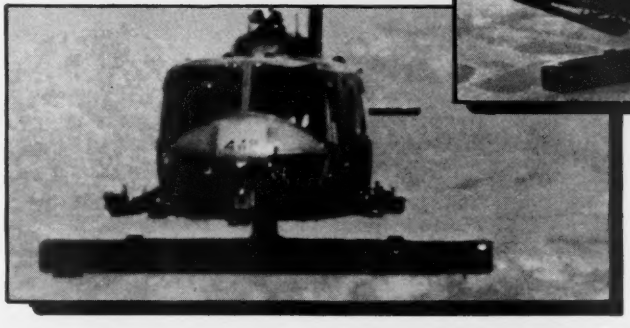
"I, like all other testers, am very concerned with the time it takes to get a new system fielded. That's why my personal goal is to make sure my project pilots provide good, reliable service and feedback to the our customers — the engineers. I want to identify problems and shortcomings now—at the prototype level—so that when an item reaches DT/OT, those people can concentrate on their assigned mission. They should not have to worry about correcting basic items that should have been identified and corrected during concept development. I feel we have really improved in this area during the past 2 years.

"We [EFTA] have a commitment to the customer to guarantee that he gets the best his dollar can buy. We are also dedicated to ensuring that the systems, when they leave us, are ready for either further testing or for use in the field. I am devoted to making sure that the product developed is useful to the soldier, usable by the soldier and of proven reliability for the soldier."

This dedication to excellence in support of the RDTE community is what the ERADCOM Flight Test Activity is all about.

Two views of the EH-1H SOTAS system.

photos courtesy General Dynamics.



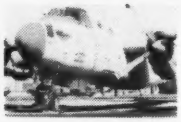
GOAL—
$2,500,000

May 1985—
$1,550,000
cash and pledges

Army Aviation MUSEUM

This is a series about the Army Aviation Museum Foundation fund drive. Currently, plans call for building a modern complex to house your Army Aviation Museum. Since last month additional donations have been received. However, we still have a ways to go, as the barometer above shows. If you would like to help "build" the Army Aviation Museum's new home, you are invited to send a tax deductible contribution to: The Army Aviation Museum Foundation, Box 610, Ft. Rucker, AL 36362-5000. If you desire additional information call Mr. Ed Brown at (205) 598-2508.

A Look At What's In Your Museum



The Neptune was originally designated P2V, and was used by the Navy since 1947 as a land based patrol bomber. However, after adding two Westinghouse jet engines under the wings the designation was changed to P2V-5F (P-2E). Other modifications made to the P2V-5 series were, deletion of the armament systems, addition of electronic surveillance gear that included lengthening the rear fuselage and the Julie/Jezebel active and passive detection systems, which resulted in a new designation of SP-2E. The U. S. Army procured 12 SP-2E aircraft from the Navy and redesignated them to AP-2E after modifying the surveillance equipment to suit the Army's needs. All 12 of these aircraft were assigned to the 1st Radio Research Company (Crazycats) in Cam Ranh Bay, Vietnam and were used for long-range, high-altitude surveillance missions. The AP-2E on display is one of 12 Army aircraft that was used in Vietnam and was flown to the U. S. Army Aviation Museum from Saigon, Vietnam in 1972.

Night Air Has Less Lift

or The PPC Card Must Be Adjusted After Sundown

Although obviously done tongue-in-cheek, this article's message is one which has Armywide application. The account of night flying brings out problems encountered by Army aviators in a humorous yet familiar presentation.

CW3 Thomas M. Flynn
Unit Instructor Pilot
1st Infantry Division
Fort Riley, KS

CW3 Elliot M. Ser
Individual Ready Reserve
Sunrise, FL

IN THE LONG history of Army Aviation, pilots have confronted numerous perplexing aerodynamic phenomena, ranging from the basic "Bumblebees and helicopters shouldn't fly, but they do," to "Why doesn't the rotor remain stationary and the fuselage spin?"

The following story is based on empirical data, gathered from the experiences of instructor pilots, whose students have concluded that night air molecules are somehow different from daylight air molecules.

Army aviators are highly skilled in computing the performance data for the UH-1 Huey. Armed with little more than a sharp pencil and fully charged pocket calculator, the modern-day air assault warrior bravely confronts chapter 7 of TM 55-1520-210-10, recording gross weights from the Form 365-F (chapter 6 of the same dash 10), weather data obtained from base operations, and calculated torque readings from trusty charts (figures 7-3, 7-4, 7-5, 7-6 and 7-7). Having completed performance planning, the unsuspecting aviator determines for the given conditions that the aircraft will require a predetermined power setting (pounds of torque). With no surprise, our intrepid aviator finds the calculations to be right on the money — during daylight hours.

Computing a night flight in the same aircraft, our aviator notes that all conditions are exactly identical to the earlier flight — crew, aircraft configuration, gross weights and weather. "Aha, I can hover that baby at the same torque as I did during the afternoon flight." Alas, our winged warrior meets with disappointment as the craft hovers with 3 pounds of torque more than the computed setting. "It can't be my calculations, and it certainly can't be my pilot technique. Therefore, the obvious conclusion is *night air has less lift.*"

Our aviator receives takeoff clearance, hovers out, still noting the extra 3 pounds of torque. "Maybe I miscalculated or misread the chart." (Note: Pilot observes Rule 1 — *never* admit a mistake to the newly assigned copilot, "Spot.") "The takeoff power was right this afternoon, I'll go with that." Once again, our aviator has a date with dismay, as the torque gauge shows an extra 5 pounds of torque above computed takeoff power. "No way I could have blown two calculations. Takeoff conditions were reported the same from tower, so the obvious conclusion is *night air has less lift.*"

Flying along on a routine night cross-country flight, our crewmembers marvel at the wonders of the universe. The stars twinkle brightly, the moon lights up the ground references and all's well with the world — or is it? Our aviator finds that the cruise power settings, calculated as meticulously as always, don't seem to be working out. Airspeed keeps slipping back, altitude keeps creeping up. "Strange, these things didn't happen during the day flight. The obvious conclusion is *night air affects the pitot-static system differently than day air*!"

Having completed the mission, our aviator heads home. "Clearance to land, straight-in runway one-niner," barks the tower.

"...Prelanding check complete. We'll be down in 1 minute," our aviator confidently informs the copilot. Five minutes later, still on a very long final, our perplexed aviator notes the closure rate is practically zero. Surely there must be a logical reason. Of course! *Night air molecules produce higher resistance than daylight molecules*!

After crewrest the following day, our aviator computes a night vision goggles flight for that night. Not a person who makes the same mistake twice (particularly back to back), our aviator makes a mental note to point out the previous night's findings to the night vision goggles instructor pilot (IP).

The moment of truth arrives. "Bring it to a hover," the IP directs. Smoothly increasing collective pitch, our aviator notes the aircraft is hovering at computed torque.

"We're cleared for takeoff...takeoff check complete, let's go," says the IP.

Our aviator pulls in some power. "Would you believe it, we're taking off at computed power setting. Something must be different."

En route, the IP commends our aviator on how well airspeed and altitude were maintained. "Nothing to it, just like the chart said it would be," our aviator replies.

"Time to head for home, we're cleared for straight-in," announces the IP.

"Watch the closure rate," our pilot thinks out loud.

"No problems with this flight," the IP informs our aviator at debriefing. "But I thought you had some new theory about the effect of night air on helicopter operations."

"I sure do, and I discovered one more tonight: night vision goggles overcome the deficiencies of night air by transforming dark airolecules into light air molecules!"

As the IP listens to our aviator's theories about night air, a mental note is made that pilot refresher classes in basic night aircraft operations might be a good idea.

Joint Tactical Deception

This article is the third in a series about projects being developed by the AirLand Forces Application Agency (ALFA). Created in 1975, ALFA's mission is to manage activities of the (Air Force) Tactical Air Command — (Army) Training and Doctrine Command team efforts toward development of improved doctrine associated with future AirLand Battle operations. The first article of the series, "ALFA Agency," appeared in the March issue. The second, "Joint Attack of the Second Echelon," was printed in the April issue. Copies of these articles can be obtained by writing to Editor, *Aviation Digest*, P.O. Box 699, Ft. Rucker, AL 36362-5000, or by calling AUTOVON 558-6680.

TACTICAL deception (TD) has long been recognized as an important force multiplier. ALFA is currently writing a joint tactical deception (J-TD) pamphlet with participation from all four services.

The Defense Science Board final report on tactical deception in AirLand warfare, released in August 1983, states that while both Army and Air Force deception doctrine are sound, they lack guidance on how to achieve effective joint deception. It went on say that, "...service joint tactical deception planning does not contain the necessary information to effectively plan and execute joint tactical deception," and it highlighted the need for a single source joint document. Additionally, the commander in chief, Readiness Command after-action report for Bold Eagle 84 reiterated the need for a single source procedural manual for joint deception operations.

Tactical Air Command (TAC) deputy chief of staff, director of operations (DOF) took the lead in resolving this problem. They contacted Combined Arms Center Development Activity, the Joint Electronic Warfare Center, the Air Force Combat Operations Staff (the Air Force's office of primary responsibility (OPR) for tactical deception) and Fleet Composite Operational Readiness Group Two (the Navy's tactical deception OPR for commander in chief, Atlantic Fleet). The U.S. Marine Corps Development and Educational Command (MCDEC) also agreed to participate in accordance with our TAC, Training and Doctrine Command, MCDEC memorandum of agreement. All supported the need for a joint manual and agreed to help prepare the document. In March 1984, the Joint Actions Steering Committee approved joint tactical deception as an ALFA managed project with TAC/DOF (later DOX) as the OPR.

This pamphlet applies to all four services and outlines a J-TD concept. It addresses tactical deception at the joint force level and, in a single source document, shows how each service conducts tactical deception operations. Its primary emphasis, however, is on how to plan, coordinate and conduct tactical deception at the joint level. Finally, this pamphlet is generic in nature with worldwide application, rather than being service specific.

The last J-TD joint working group (JWG) met at TAC headquarters, Langley Air Force Base, VA, 5 to 7 March 1985. The purpose of the work group was to resolve staffing comments on the pamphlet's first

Major Bob Ashey, USAF
TAC-TRADOC Airland Forces Application Agency
Langley Air Force Base, VA

draft. The work group also completed minor revisions to the pamphlet's structure and content.

Chapter 1 is the general chapter, outlining tactical deception doctrine. All four services are already similar in deception doctrine and this chapter combines them. It discusses TD's role in modern military operations as a combat multiplier and identifies the enemy commander as the deception target. This chapter also defines terms that may have a different meaning to each service.

Chapter 2, the threat chapter, addresses considerations a tactical deception planner should include in the planning process. The chapter is unclassified and written to provide generic threat considerations and will be useful to planners worldwide. To support chapter 2, a classified Soviet threat appendix will be included in the pamphlet.

Chapter 3 is the joint chapter. It is the heart of the pamphlet and focuses on planning and conducting tactical deception at the component and joint force (JF) levels. It delineates responsibilities and considerations for the joint force commander and his staff. This chapter also establishes the requirement for a tactical deception staff element (TDSE) within the J3 staff. The TDSE is comprised of various staff members delegated by the commander but headed by a tactical deception officer. The composition of the TDSE may vary depending upon the commander's deception plan and the number of people to whom he wishes to disclose his plan. This chapter discusses three levels of TSDE membership: commander only, limited and full staff. Chapter 3 points out that the fewer people who know of a deception plan, the better is its security. Still, there is loss of the complete expertise available from a full TDSE staff. Finally, chapter 3 establishes J-TD cooperation channels between the JF commander's staff and the staffs of his service components.

Chapters 4 through 7 are the service specific chapters. They are commonly structured along the lines who, where, when and how. They identify the individual structure each service has for planning and conducting deception operations. They are not a repeat of individual service deception manuals, but contain enough detail to inform each service how the other operates and where interface and coordination can be made. In addition, deception material and equipment within each service will be included in an appendix.

Since the March working group, ALFA has compiled the group's efforts into a second draft to be staffed within the Fleet Composite Readiness Group Two, Tactical Air Command, Training and Doctrine Command, Marine Corps Development and Education Command and Readiness Command headquarters. The final pamphlet should be completed by May 1986.

In summary, tactical deception is recognized as an important force multiplier by all four services. All four services are currently participating in writing a single source document that will help commanders and their staffs combine their efforts in a joint tactical deception program and defeat the threat.

Watch future issues for coverage of "Joint-Rear Battle" and "J-Fire."

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Mary Makowski photo by CPT Karl Graef

Optional Conversion of Survival Kit

I refer you to the article with the same title as above in the October 1984 issue of *Aviation Digest*. The second paragraph regarding specific actions has an error under action number 2. The article states, "Replace the **1-ounce bottle** of povidone iodine." The corrected text should read, "Replace the **1/2-ounce bottle** of povidone iodine." Thanks go to our readers who discover and bring these discrepancies to our attention.

Radio Pocket For SRU-21/P

When you requisition the new radio pocket for the AN/PRC-90 survival radio, NSN 8415-00-442-3616, you should use advice code 2A. This will place your requisitions on back order in case the item is temporarily out of stock; otherwise your requisition will be returned as not economically procurable and to local purchase the item. Eighteen thousand of these pockets were to be in stock by the end of March 1985.

Canned Drinking Water

Are you experiencing problems ordering canned drinking water under NSN 8960-00-243-2103? Are your requisitions being cancelled? If you'll notice, the Army Master Data File does not refer you to another NSN when this one is exhausted. This is an error we hope we have corrected. There should be another NSN listed. That NSN is 8960-00-916-4201. There is a difference in unit price of 55¢ because the second item has a plastic lid to go with it. This one is in stock and you should have no problem ordering it. Thanks to Janis Raulerson, 120th ARCOM, Ft. Jackson, MS, for bringing this to our attention.

Components of Army Aircrew Survival Vests (SRU-21/P and OV-1)

The following is a reprint of ALSE advisory message 85-2 dated 181130Z March 1985:

Flare, foliage penetrating, NSN 1370-00-490-7362 (L119) type M260, is propelled by a rocket (gyro jet) motor and will penetrate heavy foliage (including triple jungle canopy) and obtain a height of around 1,200 feet. The flare does not ignite until motor burnout. This item is used by all services and is the only authorized pen-type flare for use in the Army aircrew survival vest. This item has no age life or service life, Ref TB 9-1300-285; for operation see TM 9-1370-206-10.

Flare, NSN 1370-00-921-6172 (L116), which is also used by Army and Navy, does not meet the needs of the Army Aviation community because it has no foliage penetrating capability and obtains a maximum height of only 200 to 300 feet. The primary users of this item within the Army are ground force units. The Navy allows the use of this flare in the Aviation survival vest because of their overwater mission.

Survival components and their location as specified in appropriate supply catalogs and packing lists are mandatory. Use of locally authorized and or personal survival items is encouraged. However, they will not replace or relocate mandatory components (reference AR 95-17, paragraph 2-9A) supply catalog (SC) 8465-90-CL-PO2, 28 July 78 for SRU-21/P, packing list 11-1-1783, 9 Jan 85 for SRU-21/P; SC 1680-97-CL-A07, 30 Jan 81 OV-1 vest, packing list 11-1-468, 17 Sep 84, OV-1 vest.

All aircrew personnel should become familiar with each component and its location within the vest, in accordance with AR 95-17, paragraphs 1-4, 3-3 and 3-4.

Point of contact for this action is James C. Dittmer, AMCPO-ALSE, AUTOVON 693-1219 or commercial (314) 263-1218.

New Retest Date of Water Purification Tablets, Iodine

The following is a reprint of ALSE message 85-3, 211400Z February 1985, which concerns the retesting date of water purification tablets, iodine, NSN 6850-00-985-7166, manufactured by Van Brode Milling Company and Wisconsin Pharmacal. Do not confuse this with ALSE message 84-4 with the same subject.

The water purification tablets are components of Army Aviation survival kits, survival vests and individual first aid kits.

New retest date for water purification tablets, iodine, manufactured by Van Brode Milling Company, all lots manufactured during 1974. Subject material was tested and evaluated for serviceability and passed. Mark stock "Retest December 1986" citing Defense Personnel Support Center (DPSC) Project D850272XX as authority.

New retest date for water purification tablets, iodine, manufactured by Wisconsin Pharmacal, all lots with dates of manufacture May 1979 through and including December 1980. Subject material was tested and evaluated for serviceability and passed. Mark stock "Retest December 1986" citing DPSC Project D850271XX as authority.

Nonsuitable material water purification tablets, iodine, manufactured by Van Brode Milling Company, all lots manufactured during 1973. Subject material was tested and evaluated for serviceability and failed. Extension not approved; survey and destroy. Replacement and credit not applicable. Cite DPSC Project D850273XX. Please note that all lots of older Van Brode water purification tablets (manufactured in 1972 or earlier) were ordered destroyed by DPSC message R221502Z July 1982.

Common to all passed subject material, "Extension is applicable to bottles with good wax closures and no rusting metal caps which would be indicative of poor storage handling conditions." Local inspections are limited to viewing bottom of bottle for evidence of powdering of tablets. Wax seal is not to be broken. If the wax closure is removed the contents are subject to air deterioration making the contents unserviceable.

Point of contact is Mr. James Angelos of this command, AMSAV-MCAPS, AUTOVON 693-3889, Commercial 314-263-3889, or FTS 273-3889.

Post and Screw Assembly, Used With Chin Strap Assembly For Helmet, Flyer's, SPH-4

Post and screw assembly, NSN 8415-01-092-5290, is not part of the replacement chin strap, NSN 8415-01-057-3502, and must be obtained separately. Item is local purchase and is currently not available from depot stock.

Defense Personnel Support Center was unable to furnish a valid source of supply for obtaining small quantities due to the high cost of machine set-up and tooling required; therefore, action was initiated to have the post and screw assembly stocked in the supply system. Upon completion of procurement actions, an effective date of supply will be furnished. Additionally, the acquisition advice code on the AMDF will be changed from "L" (local purchase) to "D" (stocked).

In the interim, if unable to procure locally, requisitions (DD Form 1348-6) citing advice code 2A in card columns 65-66 should be mailed to: Commander, Defense Personnel Support Center, ATTN: DPSC-TSKR, 2800 South 20th Street, Philadelphia, PA 19101.

The routing identifier code is S9T. Under "Remarks" cite: MIL-H-43925, Drawing No. 8-2-642, Items 9-9 & 9-10; POST — ½-inch long; SCREW — ¼-inch long.

The identification list-descriptive method, currently cites the incorrect dimension for the post, which is being changed to ½-inch long.

Army point of contact at DPSC is Ms. Geraldine B. Lyles, AUTOVON 444-2537.

If you have a question about personal equipment or rescue/survival gear, write PEARL, DARCOM, ATTN: DRCPO-ALSE; 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 or call AUTOVON 693-1218/9 or Commercial 314-263-1218/9.

ASTS/BTT UPDATE

SINCE THE last Aviation Standardization and Training Seminar (ASTS) "DES Report to the Field," published in the November 1983 issue, many efforts have been made to improve our assistance oriented training program. One such improvement has been the addition of the tactics and doctrine associated Branch Training Team (BTT) as a working partner with the ASTS. But no matter what we do to improve the program, *remember,* the ASTS/BTT always will remain an assistance oriented team developed to improve training, safety and standardization throughout Army Aviation.

The ASTS/BTT has been successful over the past 2 years in providing an update to field units on the latest developments at the U.S. Army Aviation Center, Ft. Rucker, AL, as well as providing valuable feedback to the training and doctrine developers at Ft. Rucker and Ft. Eustis, VA.

The ASTS/BTT is designed to be an extremely flexible organization and is available to Active Army, National Guard and Reserve units. Subjects covered, training conducted, length of the visit and team membership vary with each visit, based on the specific request/requirements of the unit visited. The ASTS/BTT is intended to be for *assistance only.* Team members will *not be evaluators* but will act as trainers and instructors in their respective area. Thus far the ASTS/BTT has visited these continental United States (CONUS) locations: Ft. Campbell, KY; Ft. Lewis, WA; Ft. Riley, KS; Ft. Carson, CO; Ft. Ord, CA; Ft. Bragg, NC; Ft. Stewart, GA; Ft. Sam Houston, TX; Ft. Hood, TX; Ft. Bliss, TX; and Ft. Huachuca, AZ. Overseas visits have been made to Alaska, Europe, Turkey and Korea. Most of these locations have already been visited twice since the inception of the ASTS. Ten additional installations are scheduled for an ASTS/BTT during the remainder of fiscal year 1985.

An ASTS/BTT visit will not be scheduled unless it is first requested by the unit. Ideally, the visit should be scheduled about 6 months prior to the CONUS unit's Aviation Resource Management Survey or the outside CONUS unit's annual evaluation/assistance visit. The request should be submitted as early as possible, preferably during the second quarter of the fiscal year preceding the fiscal year of the visit.

Due to the DES worldwide mission, our limited manpower and fiscal resources are continually taxed to the limit. This prevents us from meeting all requests for assistance or in providing expertise in a given area. To maximize the effective management of our assets, DES will be forced to visit an installation/geographical area for requested assistance only once a year. This makes it critical that once an ASTA/BTT is scheduled, that surrounding/affiliated Reserve Component and other major Army command units/elements be invited to participate, thereby ensuring maximum benefit to all concerned during the annual assistance visit.

About 3 or 4 months prior to the scheduled visit, the installation should designate a point of contact (POC) (normally from the installation flight standardization office). The installation POC will coordinate directly with the Aviation Center POC from DES. Each unit should closely analyze its training situation and transmit specific requests to the POC. The POC will consolidate these requests and submit them to the Aviation Center. When topics for the ASTS/BTT visit have been identified, the POC should prepare a training schedule of subjects to be covered, units to be visited, classrooms to be used and their locations. This itinerary should be incorporated in each unit's weekly training schedule to allow for maximum participation.

Experience has proven that a visit to a battalion sized unit will last about 2 days. This will vary, of course, with the specific needs of each unit. Membership of an ASTS/BTT is seldom the same for any two visits. The membership of each visit is tailored to fit the specific needs of the unit visited. The typical ASTS/BTT, as depicted on the next page, is best employed by providing the tactics instruction (BTT) and courtesy inspections (ASTS) on the first day with the

general Aviation seminars (ASTS) following the next day. This method of employment allows the unit aviators to take advantage of the tactics, general Aviation seminars and courtesy inspections without the times of the seminars or courtesy inspections conflicting. A typical team might consist of the following:

Team Chief: Conducts seminars and discussions with unit commanders.

Team Coordinator: Coordinates training assistance requirements with the visited unit's POC, forms the team and assigns subjects, coordinates with various agencies for subject matter expert (SME) representation.

Instructional Systems Research Evaluators: Collect data pertaining to the quality of instruction at Training and Doctrine Command schools through informal individual/group interviews and/or the administration of surveys/questionnaires.

ALSE Representative: Conducts Aviation life support equipment (ALSE) seminars and courtesy ALSE inspections.

Avionics Representative: Conducts avionics seminars and courtesy avionics inspections.

Flight Records Representative: Conducts flight records and aircrew training manual courtesy inspections.

Safety Officer: Conducts safety seminars/discussions and courtesy safety inspections.

POL Representative: Conducts courtesy petroleum, oils and lubricants inspections.

Maintenance Test Flight Evaluators (MTFE): Conduct MTFE seminars and training flights.

Standardization Instructor Pilots (SIP): Conduct Aviation related classes, aircraft specific discussions/seminars and training flights.

Tactics SME: Provides current Aviation related tactics and doctrine instruction, answers questions and provides other assistance as requested by the unit.

As stated above, the team composition will be based on the unit's needs. MTFE, SIP and SME support would depend on the assistance requested by the unit.

Team membership is not limited to the Aviation Center. Regular team members are the MTFE and ALSE personnel from Aviation Logistics School. Other team members have come from Ft. Lee, VA; New Cumberland Army Depot, PA; Army Materiel Command; and the U.S. Army Aeromedical Center, Ft. Rucker.

Units should request any assistance needed. The team coordinator will tailor the team to match the requested assistance if suitable assets (personnel, funds, etc.) are available.

Academic training may cover any Aviation related subject area requested by the unit. The format for this instruction can be either formal instructional periods, informal question/answer periods, group seminars/discussions or individual instruction. Possible subject areas might include:

Performance planning.
Air-to-air doctrine update.
Instrument flight rules and visual flight rules flight planning.
Specific aerodynamic subjects (e.g., loss of tail rotor effectiveness.)
Instructor pilot fundamentals.
Aviation regulations (e.g., Army Regulation 95-1).
Current messages and standardization communications.
Test flight procedures.
Threat briefing.
Night vision goggles (NVG) mission planning and tactical employment.
Tactics seminars.

This list is not intended to be all inclusive. Units will have an opportunity to request any assistance required for their aviators/unit during the coordination phase prior to the visit. Assistance requested will be provided if assets are available.

Flight training also can be requested by the unit. It can consist of tactical maneuver demonstrations, NVG flights, maintenance test pilot equivalency flights or a flight evaluation (the last two mentioned will be provided only at the request of the unit commander). Due to the limited time available and to present the maximum amount of training to the maximum number of people, flight training should be kept to a minimum. For the most part, a flight in an aircraft can benefit only one or two people; but a class or seminar can benefit more than a hundred. Training flights requested by the unit will be flown, but the emphasis should remain on the academic instruction.

A report on the unit will not be written, and gradeslips for any training flights conducted will not be issued unless requested by the unit commander. Training feedback in the form of questions that cannot be answered during the ASTS/BTT will be researched at the Aviation Center and answers will be forwarded directly to the unit. An *internal* DES after-action report will be written and used only to improve future visits. The after-action report will contain only administrative and logistical comments concerning the trip. This report is forwarded to the visited unit(s) for their information/files.

The ASTS/BTT was the first Armywide, onsite training program designed to improve Aviation safety, standardization and training. Our goal is to bring to your unit the very best assistance program in the Army, and with your help, we will attain that goal. Any questions or requests concerning the ASTS/BTT may be made by calling AUTOVON 558-4691/6571, FTS (205) 255-4691/6571, or by writing DES, ATTN: ATZQ-ES-E, Ft. Rucker, AL 36362-5000.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362-5000; or call us at AUTOVON 558-3504, FTS 533-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hotline, AUTOVON 558-6487 or 205-255-6487 and leave a message.

AVIATION PERSONNEL NOTES

New Age Restrictions and Service Obligation For Flight School Attendance

As a result of issues concerning an aging aviator force in the Reserve Components, the Deputy Chief of Staff for Personnel has directed age limitations and increased service obligation for flight school attendance.

Effective 1 July 1985, all Army attendees (Active or Reserve Component) of the Initial Entry Rotary Wing Course or the Warrant Officer Candidate Rotary Wing Course must be at least 18 but not more than 30 years of age upon entry into the course. This policy will not apply to any individual currently approved or on orders for course attendance. Applicants now applying for flight school must meet these age restrictions. Additionally, Army Reserve and National Guard applicants to flight school will not be older than 27 years, 6 months at the time of application. Reserve Component officers applying for the Civilian Aviation Accession Program under provisions of paragraph 2-3, AR 600-105, may not be older than 32 years of age. This restriction is waiverable to age 35 upon the recommendation of a flying evaluation board and the approval of the Chief, National Guard Bureau or Chief, Army Reserve as appropriate.

Effective 1 October 1985, attendees (Active and Reserve Component) of the Initial Entry Rotary Wing Course or the Warrant Officer Candidate Rotary Wing Course will incur a 5-year service obligation upon graduation. Active commissioned officers who voluntarily withdraw from the course also will incur the 5-year Active Duty service obligation (see paragraph 1-6b, AR 611-110). The previous 4 year's service obligation will apply to any Active Duty or Army National Guard individual currently attending flight school or on orders for course attendance. The revised service obligation of 5 years will apply to individuals currently applying for flight school if they are to be scheduled for attendance after the 1 October 1985 implementation date.

The age restrictions align the Army's flight program with those of the other services who already have age restrictions, and the increased service obligation permits effective management of trained resources and a reasonable return to the Army for the training dollar expended.

Medical Disqualification Date Revised

Recently, the Department of Defense changed the policy regarding the date of medical disqualification for Aviation service. Previously, an aviator lost his entitlement to Aviation Career Incentive Pay (ACIP) on the first day of the sixth month following the month of incapacitation. For example, if the aviator became medically incapacitated on 15 May 1985, the date of medical disqualification and loss of entitlement to ACIP was 1 November 1985.

The revised policy is that disqualification for medical incapacitation will be effected on the first day following a period of 180 days that commences on the date of incapacitation. In our example of the 15 May 1985 date of medical incapacity, this aviator will be medically disqualified on 11 November 1985, which is the day following the established 180-day period.

The date of disqualification will be specified in a Department of the Army order which will also change the pilot status code (PSC) from 1 (qualified for Aviation Service) to PSC 2 (medically disqualified).

AR 600-105, "Aviation Service of Rated Army Officers," and the DOD Pay Manual will be revised to include this change.

Lieutenant Colonel Command Selection

Congratulations to the following aviators! They will command Aviation battalions in fiscal year (FY) 1986.

Combat Battalions

Anastasio, Michael Anthony
Bailey, Robert Bernard
Ballou, Justin Guy III
Beauchamp, James Wayne
Butler, James Marion
Clontz, William Ralph
Cross, Dennis Dale
Dallas, Michael Dana
Dally, Floyd Eugene
Dickens, William Phillip Jr.
Edwards, Warren Chappelle
Ferguson, Bernard Borland
Fucci, Joseph Anthony
Garrett, Thomas William
Gibson, Emmitt Edison
Heath, Herman Stanley
Johnson, Gregory Thomas
Kyle, David Lee
McCabe, Laurence William III
McGill, William Daniel II
McGrory, James Charles Jr.
McLendon, Walter Harris
Mullendore, Lauren Gregg
Nelson, Wayne Thomas
Raho, Steven Andrew III
Retta, Lawrence Roland
Tackaberry, Burt Stewart
Turpin, Johnny G.
Whitehead, Erwin Eugene
Yacovitch, Paul Nicholas

Aerial Exploitation Battalions

Kells, Thomas Johnston Jr.
Mitchell, Richard Ronald

Air Traffic Control Battalions

Crawford, Sterling Benton
Gwin, David Christopher
Geoghagan, Michael Stuart
Hufford, Kent Victor

Aviation Maintenance Battalions

Griggs, Dennis Lee
Kean, Robert Barrett
Johnson, Thomas Eyre
Wyatt, Jake Wayne

Some statistical analysis regarding all 467 selectees of the FY 86 lieutenant colonel command list shows that:

- Mean year group was 1968. That is, more were chosen from this year group that any other.
- Average age for combat arms selectees was 38 years.
- Active Federal Commission Service for entire list:

  Least — 14 years, 1 month
  Most — 20 years, 9 months
  Average — 17 years, 8 months

- Military Education:

  War College Selectees/Graduates 7
  Staff College-Resident 420
  Staff College-Non-Resident 40

- Civilian Education:

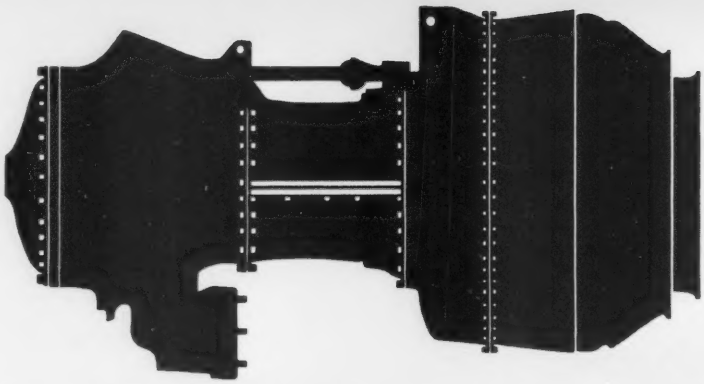
  Doctoral Degree 6
  Master Degree 349
  Bachelor Degree 112

Enlisted Update

The career management field (CMF) 67 restructure is now in place. The most visible impact is at the rank of E7. Previously, an E7 supervisor in Aviation had to be familiar with all aircraft in the Army's inventory. In the present system, our E7 supervisors specialize on one family of aircraft (e.g., fixed, cargo, utility). This specialization was spread to the technical inspectors also. Aviation now has one 66 military occupational specialty (MOS) that does the technical inspection for each aircraft, rather than the one MOS 67W that formerly did technical inspections for all aircraft. The period to train enough 66-series soldiers for the Army was set at 2 years, which makes completion date for this endeavor about January 1986.

While not as visible as MOS changes, a major component of the CMF 67 revision was a fundamental change in the way Aviation soldiers are trained. If you are involved with Aviation maintenance, you shoud be benefiting from the new personnel in the 67 career field who were trained under the newly revised CMF 67 in FY 84 and 85. If you are not up to date on the changes within CMF 67, you are not likely to get the most effective use of your new 10-level soldiers, and you may be using the new 66-series technical inspectors incorrectly.

AVIATION LOGISTICS



TEAC Means Guaranteed Engine Performance

Will the power you expect to have be there to allow you to complete your mission or to get you out of a tight situation? It will if the maintenance test pilot has conducted a good turbine engine analysis check.

Major Steven L. Ochsner
U.S. Army Aviation Logistics School
Fort Eustis, VA

WITH THE COMPLETION of the second year since the introduction of FM 55-44, "Standardized Maintenance Test Procedures," Army rotary wing maintenance test pilots (MTP) worldwide have become well acquainted with the newly placed emphasis on correct performance of maintenance test flight tasks.

As the proponent for FM 55-44, and as the agency tasked with assisting full implementation of test flight standardization programs, the Directorate of Evaluation and Standardization, U. S. Army Aviation Logistics School (DOES-USAALS), travels worldwide evaluating maintenance test pilots and maintenance test flight standardization programs.

During these last 2 years DOES has visited all major installations and major overseas commands as well as a high percentage of U.S. Army Training and Doctrine Command, U. S. Army Materiel Development and Readiness Command, U. S. Army Reserve and National Guard Aviation facilities. In many areas, test flight standardization programs are fully implemented and integrated into overall Aviation standardization programs.

As with any Army program, the trainee/evaluator holds the key to its success. So it is with the maintenance test flight evaluator (MTFE). If the MTFE has the ability to conduct successful initial and continuation training programs, and to follow on with realistic evaluations of test pilots, the maintenance test flight program will be a success. To assist MTFEs in the conduct of their training program and evaluation, DOES has conducted MTFE seminars for Reserve Components and will conduct similar seminars for Active Army duty installations in conjunction with the Ft. Rucker, AL, Aviation Center Branch Training Team upon request.

Additionally, DOES is developing an MTFE Information Bulletin which can be mailed to requesting units. Finally, MTFEs can consult standardization instructor pilots (SIPs) to discuss the training/evaluation concept and ask the SIPs to provide a constructive critique of their oral and flight evaluation techniques during actual evaluations.

Turbine Engine Analysis Checks

During the past 2 years, DOES has noted and, for the most part, been able to correct many deficiencies in test flight procedures. Most deficiencies found have been localized, resulting from misconceptions and, largely, have been readily correctable. Turbine engine analysis checks (TEAC) and topping checks for the UH-1 Huey, AH-1 Cobra and CH-47 Chinook have been one alarming exception.

Widespread discrepancies exist in the performance, analysis and recording of these checks. DOES has found cases where UH-1s have not had a topping check performed in more than 5 years, CH-47s in 3 years and AH-1s that have never had a topping check. In instances where DOES evaluators perform an engine topping as part of no-notice checkrides, it is only rarely that engine performance meets prescribed parameters. *TEAC performance and analysis is,* consistently, the *single weakest area* of overall test pilot performance.

The requirement to do TEAC is stated in the engine and maintenance manuals for the UH-1, AH-1 and CH-47. Baselines are required when new engines or fuel controls are installed, when major engine components are removed or replaced or as otherwise stated in the respective engine or maintenance manuals.

The baseline TEAC actually involves two distinct parts. The first part involves several steps including exhaust gas temperature (EGT) testing, bleed air actuator checks, compressor inspections, verification of engine performance indicating systems, and other checks to assure, as far as possible, the proper functioning of engine systems while still on the ground.

The second part is the airborne topping check. During this check the engine power is stabilized at its maximum output and engine performance readings are taken. These readings are compared with engine performance charts and the data is used to adjust the fuel flow to ensure that the engine can deliver maximum rated power. Upon completing a topping check that meets the engine performance parameters, the data is recorded on the DA Form 2408-15 with overprint for aircraft turbine engines and retained in the aircraft historical records.

A second requirement for TEAC, the normal TEAC, occurs when engine performance becomes suspect, normally through high health indicator test (HIT) checks, or when the aircraft completes a phase inspection as part of the general test flight. In either case, results are compared with the previously recorded baseline TEAC and troubleshooting is accomplished to identify faulty systems. Thus, through verification of engine performance indicating systems, baseline topping checks that accompany engine installation, continuous monitoring of engine performance with daily HIT checks and normal topping checks, the maintenance officer is assured that the engine is able to deliver maximum rated power.

The critical performance of the TEAC program is that it serves as the basis for the operators manual performance planning charts. Only through completion of all aspects of TEAC can proper fuel control adjustments be made. Without a properly adjusted fuel control the engine may not be able to deliver the power computed on the performance planning charts.

As aircraft maintenance officers it is incumbent upon us to reestablish TEAC programs in our units. As a minimum, all of DA Form 2408-15 should be reviewed and analyzed. Where records indicate engine topping checks have not been performed for extended periods or where topping data recorded does not meet prescribed parameters, the engine should be topped as soon as possible. Test pilots and technical inspectors should review published procedures for analysis and recording of topping data. MTFEs should conduct academic classes and flight training periods on correct performance of topping checks. Finally, maintenance officers should insist that all aspects of TEAC are accomplished. Only through this effort can we guarantee pilots they will have the power they expect to have when completing performance planning data.

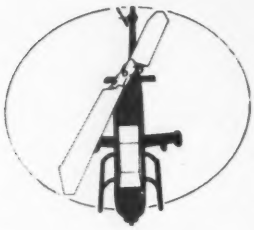
There are a few items with regard to each aircraft that should be mentioned before ending the TEAC discussion.

CH-47 TEAC (by Major Steve Ochsner)

The TEAC chart currently published in TM 55-1520-241-MTF in figure 5-17 and labeled "TEAC Chart T55-L-11 with Fiberglass Blades" is based upon 245 rotor rpm and, therefore, is erroneous. Use the L-11 fiberglass blade chart published in chapter 4 of TM 55-1520-227-23-2. Fiberglass blade users should recheck all of their DA Forms 2408-15 to assure that the test pilot who last topped the engine used the correct chart.

DOES has noticed a wide variation in how units receiving the T55-712 engines accomplish topping checks. It is important to recognize that the procedures published in Change 19 of TM 55-1520-227-23-2 are the *only* procedures currently authorized for accomplishment on the 712 TEAC and topping. DOES would appreciate feedback from the field on problems encountered with the TEAC on the 712.

Turbine Engine Analysis Check, *continued*



AH-1 TEAC (by CW4 Ralph Winfrey)

DOES is aware of the problem that exists with topping the T53-L-703 engine. A note in TM 55-2840-229-23-1, page 1-301, paragraph 1-117 states, "... Topping not required for T53-L-703 engines below +30 degrees Centigrade (86 degrees Fahrenheit)," and, subsequently, most units have disregarded the topping checks completely. They are releasing an aircraft flyable without determining whether it will develop maximum rated power.

By completing the ground portion of the TEAC and flying the aircraft to 10,000 feet pressure altitude, increase collective to maximum available power, the MTP can verify that the engine will produce maximum rated power. This is especially critical after a fuel control replacement to verify correct trimming of the newly installed fuel control.

DOES is developing a procedure to determine maximum power when weather and/or temperature prevent completion of a topping check. This procedure, to be called the maximum power performance check, should be completed and published at some future date. Until this procedure is published, MTPs should complete TEACs when required and at least attempt to top the engine.

UH-1 TEAC (by CW3 George Hrichak)

In the UH-1 we appear to have a problem with recording topping checks on the DA Form 2408-15. Although paragraph 10-39 of TM 38-750 describes the DA Form 2408-15 and covers all you need to know to record topping data, many problems are encountered involving accurately filling in the required and actual blocks for N_1, torque and exhaust gas temperature.

The numbers used in the actual blocks, for N_1, torque and EGT are those readings recorded when the engine was actually topped. In recording a baseline TEAC, the required N_1 will remain the same as the actual N_1, unless the compensated air temperature is +30 degrees Centigrade or above, or -20 degrees Centigrade and below. In these cases +0.5 percent is added to the actual N_1 and the sum is put in the N_1 required block. This number will remain in the N_1 required block for each subsequent normal TEAC until a new baseline TEAC is established.

The only other time that number will change is when compensated air temperatures exceed +30 degrees Centigrade and above or -20 degrees Centigrade and below for normal TEAC. In these cases, 0.5 percent is subtracted from the baseline N_1 required block and the result inserted in the normal TEAC N_1 required block. For normal TEAC, the required and actual N_1 figures should be within ±0.7 percent of each other.

For a baseline TEAC the actual EGT is that recorded during topping. Apply the correction factor from the EGT Adjustment Factors Table in TM 55-2840-229-23-1 to the EGT recorded in flight to obtain the required EGT. In effect, the EGT at the temperature and altitude at which the aircraft engine was topped is corrected to standard day conditions.

To perform a normal TEAC apply the correction factor from the EGT Adjustment Factors Table to the required EGT on the last baseline TEAC and compare the result to the EGT recorded in flight. These two figures must be within ±20 degrees Centigrade. Record the EGT obtained in flight in the actual column and the corrected EGT from the previous baseline in the required column for a normal TEAC.

If the N_1, torque and EGT obtained on a normal TEAC do not meet the prescribed parameters, appropriate troubleshooting must be accomplished. In performing normal TEAC remember the data obtained is *always* compared to the last baseline TEAC recorded. Finally, include a brief statement why the TEAC was performed in the remarks column of the DA Form 2408-15.

Points of contact listed in this article can be reached at AUTOVON 927-3266/4164 or by writing Commandant, USAALS, ATTN: ATSQ-ESM, Ft. Eustis, VA 23604-5431.

V A TO Z

nailing the numbers

Understanding V-Speeds—the keys to optimum aircraft performance—By Barry Schiff

Reprinted from the **AOPA PILOT**, July 1984, Copyright Aircraft Owners and Pilots Association 1984, all rights reserved.

U.S. ARMY SAFETY CENTER

Although we realize that fixed wing aircraft make up a small percentage of the Army fleet, we felt our fixed wing aviators would find the information in this article useful.

IN THE EARLY days of aviation, when airplanes were slow and simple, pilots managed airspeed by interpreting the sound of flying wires whistling in the wind. They were adept at sensing when the machine was about to stall or when airspeed was so great that it threatened to rip or break something. In those carefree days, a pilot had only two airspeed limits to observe—too slow and too fast. Everything in between was fair game.

As airplanes became faster and more complex, "seat-of-the-pants" flying became less reliable if not impossible. Pilots had to become more precise with their airspeed control. Advances in aerodynamic knowledge gave pilots a better understanding of aircraft performance. This knowledge soon was reflected in certification requirements that emphasized the need to determine an airplane's optimum airspeeds. The "seat of the pants" was replaced with "flying by the numbers."

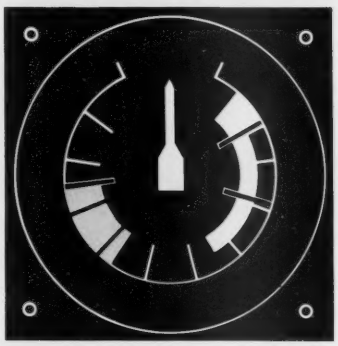
Most of these numbers are known as V-speeds (the V stands for velocity) and are defined in Part 1 of the Federal Aviation Regulations. Unfortunately, the brevity and simplicity of these definitions belie the complexity of many of the underlying concepts. Although a thorough understanding of these limiting airspeeds requires a knowledge of aerodynamics and aircraft performance, an attempt is made here to simplify the concepts without sacrificing the important operational aspects.

When a designer begins to develop a new aircraft, he knows about how fast it must be able to fly. This maximum airspeed is known as V_D, the design diving speed. In theory, the airframe is designed to withstand the aerodynamic forces at V_D and be free of flutter, control reversal and buffeting.

Once the design evolves into hardware, the experimental test pilot must determine if the airplane lives up to expectations. He does this by diving the airplane to V_D (in **very** smooth air) and—once there—attempts to verify that flutter cannot be induced. Flutter is not difficult to detect. Each part of an airframe, especially the control surfaces, has a natural vibration frequency and begins to flutter like a flag in a breeze at certain critical airspeeds. If flutter begins, it may become catastrophically divergent, which is an engineer's way of saying that it worsens until the aircraft is destroyed even if airspeed is reduced as soon as flutter begins.

Some aircraft are incapable of reaching V_D because of insufficient power or excess drag. In such a case, the test pilot dives to the maximum speed possible, which is called V_{DF}, the demonstrated-flight diving speed. Those who are not test pilots have no business flying at V_D or V_{DF}. We are limited to V_{NE}, the red-line or never-exceed speed.

Although an airplane can be flown safely at V_{NE}, pilots should avoid this limit because the structural integrity of the airframe has substantially less tolerance for turbulence at the red line than at slower speeds. Even in smooth air, pilots cannot preclude the possibility of unexpected turbulence.



The G loads imposed by turbulence easily can overstress an airplane flying at V_{NE}. The dangers of flight at V_{NE} can be further compounded by poorly rigged control surfaces and balance assemblies and improperly adjusted control rods and cables. These deficiencies can lead to flutter-induced airframe failure at high airspeeds.

If a pilot inadvertently reaches V_{NE}, he should slowly roll the wings level (if applicable), reduce power and gingerly raise the nose.

V_{NE} applies only to piston-powered airplanes. Turboprop and jet aircraft are limited by V_{MO}, the maximum operating limit speed. (M_{MO} indicates a maximum allowable Mach number.) In practice, V_{NE} and V_{MO} are treated the same; each represents a maximum speed limit. V_{MO}, however, provides a wider margin of safety because it is only 80 percent of V_{DF}. This is necessary because turbine-powered airplanes (including turboprops) do not decelerate as well as piston-powered aircraft and cannot be slowed up rapidly in case of a turbulence encounter at high speed. This explains also why converting a piston airplane to a turboprop necessitates a lower red line.

If an aircraft exhibits undesirable stability characteristics under certain high-speed conditions, this alone could result in reducing allowable airspeed to something less than V_{NE} or V_{MO}. Such a restriction is called V_{FC}, the maximum speed for (undesirable) flight characteristics, and must be regarded with the same respect as a conventional red line. Otherwise, instability could develop beyond a pilot's ability to cope.

At the opposite end of the speed spectrum are the stall speeds. The first is V_S, which is the minimum steady flight speed at which the airplane is controllable. By itself, however, V_S is only a generic term and usually does not represent a specific airspeed. It is used only when discussing stalls in general. Notice that a stall is not necessarily characterized by the nose pitching down. An aircraft is said to be stalled whenever its wings' critical angle of attack is reached or exceeded. In this condition, airspeed is insufficient to maintain attitude about **any** axis in smooth air.

Specific stall speeds must be defined. V_{SO}, for instance, generally is determined with the airplane in the landing configuration: engine(s) idling, propeller(s) in low pitch, wing flaps in the landing position, cowl flaps closed, center of gravity at the maximum-allowable forward limit and the aircraft loaded to its maximum-allowable gross weight. It is found by maintaining a wings-level attitude and decelerating at one knot per second. If deceleration is excessive, an increased load factor — even though imperceptible — may cause a premature or accelerated stall. Vso is represented by the lower limit of the white arc on

On Target

A table of limiting and recommended V-speeds.

V_1	Takeoff decision speed (Multi)
V_2	Takeoff safety speed (Multi)
V_{2MIN}	Minimum takeoff safety speed (Multi)
V_A	Design maneuvering speed
V_B	Design speed for maximum gust intensity
V_C	Design cruising speed
V_D	Design diving speed
V_{DF}	Demonstrated diving speed
V_F	Design flap speed
V_{FE}	Maximum flap-extended speed—Top of white arc
V_H	Maximum speed in level flight with maximum continuous power
V_{LE}	Maximum landing-gear extended speed
V_{LO}	Maximum landing-gear operating speed
V_{LOF}	Lift-off speed
V_{MCA}	Minimum control speed with critical engine inoperative out of ground effect (Multi)—Red radial line
V_{MCG}	Minimum control speed with critical engine inoperative during takeoff roll (Multi)
V_{MO}	Maximum operating limit speed (Turboprop/turbojet)—Red line
M_{MO}	Maximum operating Mach number (Turboprop/turbojet)—"Barber pole"
V_{MU}	Miminum unstick speed
V_{NE}	Never-exceed speed—Red line
V_{NO}	Maximum structural cruising speed—Top of green arc
V_R	Rotation speed
V_{REF}	Reference speed for final approach
V_S	Stall speed or minimum steady flight speed at which the airplane is controllable
V_{S1}	Stall speed or minimum steady flight speed obtained in a specific configuration—Bottom of green arc
V_{SO}	Stall speed in the landing configuration—Bottom of white arc
V_{SSE}	Minimum safe single-engine speed (Multi)
V_X	Best angle-of-climb speed
V_{XSE}	Best single-engine angle-of-climb speed (Multi)
V_Y	Best rate-of-climb speed
V_{YSE}	Best single-engine rate-of-climb speed (Multi)—Blue radial line

the airspeed indicator.

Many pilots wonder how landing-gear or cowl-flap position can affect stall speed. When underwing gear is extended, it forces some of the oncoming air to flow up and over the leading edge of the wing in the manner of leading-edge flaps or slats, thereby reducing stall speed slightly (if at all). When open, sufficiently large cowl flaps can deflect downwards enough air to produce lift, thereby supplementing the wings in carrying the load and reducing stall speed. Decreasing gross weight or moving the center of gravity aft also decreases stall speed. The maximum-allowable V_{SO} for single-engine airplanes and many light twins is 61 KCAS (70 mph).

V_{S1} generally is regarded as the "clean" (gear and flaps up) stall speed as represented by the lower limit of the green arc of the airspeed indicator. But this is not always the case. Technically, V_{S1} is the stall speed in a specified configuration. It could represent the stall speed with flaps in the takeoff position or with the aircraft configured in any of several different ways. It all depends on what is being considered at the time. The clean stall speed, therefore, is designated as V_{S1} (clean). By itself, V_{S1} is meaningless.

Closely related to V_{SO} is the reference speed, V_{REF}, which FAA recommends as the final approach speed. Since V_{REF} 1.3 times V_{SO}, it is easy to determine without an operating handbook. Simply note the airspeed indicated by the low end of the white arc and increase it by 30 percent. For instance, a V_{SO} of 50 knots suggests a V_{REF} of 65 knots.

There are five V-speeds involved with takeoff and climb. The first is V_{MU}, the minimum unstick speed, which is the slowest speed at which an airplane can become airborne. V_{MU} seems to have originated in the era of the de Havilland Comet, the world's first jet transport. During one particular takeoff attempt in a Comet, the captain raised the nose so high and prematurely that the resultant drag rise prevented further acceleration and liftoff. V_{MU} tests subsequently were established to ensure that future transports could take off with the tail touching the runway and maintain this attitude until out of ground effect. Such a hazardous maneuver is required only during aircraft certification trials and ordinarily should not be attempted.

Nailing The Numbers

V_Y, unlike V_X, decreases with altitude, something many pilots fail to consider during prolonged or high-altitude climbs.

Although general aviation aircraft do not undergo V_{MU} testing, there are lessons to be learned from the Comet problem. Inexperienced pilots flying heavily loaded and frequently underpowered airplanes from high-density-altitude airports often display impatience at the time and distance required to reach a safe takeoff speed. Consequently, they raise the nose prematurely. This adds considerable drag and could prevent the aircraft from ever becoming airborne or climbing out of ground effect. If conditions are insufficient for accelerating to a safe takeoff speed, it is best not to take off at all.

Recommended takeoff speed usually is found in the pilot's operating handbook. Such a speed also is known as V_{LOF}, the liftoff speed. Usually, however, it is recommended that a pilot raise—or rotate—the nose at some lesser speed, which is known as V_R. The optimum takeoff technique consists of applying back pressure at V_R in such a way that the aircraft continues to accelerate during rotation and lifts off at the recommended takeoff speed. If the aircraft becomes airborne at an airspeed lower than V_{LOF}, rotation was excessive; if it becomes airborne at an airspeed higher than V_{LOF}, rotation was insufficient.

The lowest climb speed for lightplanes generally should not be less than V_X, the speed that results in the best (or greatest) angle of climb. V_X, however, is not a fixed airspeed as is implied by most handbooks. The speed provided usually is valid only when the aircraft is at sea level at maximum-allowable gross weight with the wing flaps in the takeoff position. For most lightplanes, V_X, increases with altitude (about one-half knot per 1,000 feet) and flap retraction; it usually decreases with a reduction in gross weight. Although a headwind increases climb angle and a tailwind decreases it, V_X does not vary with wind.

The speed for best rate of climb, V_Y, is always faster than V_X and usually is provided only for a flaps-up, gear-up configuration. Like V_X, V_Y decreases as gross weight is reduced, but unlike V_X, it decreases with altitude, something many pilots fail to consider during prolonged or high-altitude climbs.

V_Y also is very close to the speed at which the lift-to-drag ratio of an airplane is at a maximum and, therefore, is close to being the most efficient speed. Lacking other information, therefore, a pilot can consider V_Y a reasonable substitute for the best-glide speed or the maximum-endurance speed, which is useful for minimizing fuel burn when holding. (Maximum range normally is achieved with an airspeed that is 10- to 20-percent greater than V_Y.)

There are two cruise-related V-speeds. The first, V_H, is primarily of concern to racing pilots and those

who prepare advertising brochures. It represents the maximum speed in level flight with maximum-continuous power. Ultralights are limited by FAR Part 103 to a V_H of 55 knots/63 mph.

The second is V_C, the design cruising speed, which many pilots consider to be aircraft cruising speed. But this is incorrect; a given aircraft may cruise slower or faster than V_C. The design cruising speed is of concern only to designers and is the greatest speed at which an aircraft must safely withstand the FAA's standard 50-fps gust.

There actually are several values of V_C for a given aircraft, but the lowest normally is used to designate V_{NO}, the maximum structural cruising speed. This speed is of critical importance to a pilot and is indicated by the beginning of the yellow arc—or caution range—on the airspeed indicator.

When flying at V_{NO}, a pilot knows only that the aircraft can tolerate the FAA's mathematically defined, 50-fps gust. Since a pilot has no way of measuring gust intensity and since an airplane's gust tolerance decreases substantially when flying beyond V_{NO}, it behooves a pilot to avoid flight within the yellow arc whenever turbulence is present or expected. Structural engineers concede that most airplanes cannot safely withstand some of the most severe gusts nature has to offer. It is the pilot's responsibility to take over where the designer leaves off by avoiding such conditions in the first place or by penetrating severe turbulence at a relatively slow airspeed.

The vast majority of lightplanes have been certified according to the requirements of FAR Part 23. A few, however, conform to the more stringent dictates of FAR Part 25, which were developed for Transport-category aircraft. These aircraft have a speed designated as V_B, the design speed for maximum gust intensity. Depending on the airplane and the philosophy of the manufacturer, V_B (or a variant of it) may be designated as the recommended turbulence-penetration speed to protect the structure against 66-fps gusts.

In addition to protecting the airframe as much as possible against turbulence, designers also must protect the aircraft against structural loads imposed by rapid and maximum deflection of the flight controls. This protection is available only when flying at or below V_A, the design maneuvering speed.

Most pilots realize that rapid and full up-elevator deflection when at or below V_A causes the aircraft to stall before damaging load factors can develop. But this form of aerodynamic relief cannot protect against the loads imposed by rapid and full deflection of the ailerons and rudder. Instead, the structure simply must be built strong enough to withstand such abusive control application. When flying at speeds above V_A, a pilot has no such assurances and must be cautious about manhandling the controls. This is particularly applicable when flying in turbulence because the combination of loads imposed by gusts and maneuvering is cumulative. Whenever in doubt about the structural integrity of an airplane, reduce airspeed as much as practical. (Consider also that V_A usually decreases as the gross weight of an aircraft decreases.)

During the design of an airplane, a structural engineer designs the flaps to be operated at a maximum airspeed of V_F, the design flap speed. If the finished product is as anticipated, the actual maximum flap-extended speed, V_{FE}, will be the same as V_F and will be designated by the upper limit of the white arc on the airspeed indicator.

Although it is allowable to operate the flaps at V_{FE}, there is no reason to subject the flap hinges, actuating mechanisms and related structures to such abuse. Habitually extending the flaps at V_{FE} increases fatigue and may result in a premature failure of a flap-system component. Proper care of an aircraft suggests that flap extension be delayed—when possible and practical—until airspeed is somewhat less than V_{FE}.

Pilots should consider also that the positive limit-load factor for Normal-category airplanes usually is reduced from 3.8 Gs to 2.0 Gs when the flaps are extended. Similarly, the negative limit-load factor is reduced from -1.52 Gs to 0. Unless necessary, it may be advisable not to deploy flaps when substantial turbulence is anticipated.

Care also should be taken not to extend or retract the landing gear consistently when at or near V_{LO}, the maximum landing-gear operating speed. In most cases, V_{LO} is limited by the relative vulnerability of wheel-well doors to high air loads. On some aircraft, the wheel-well doors close after the gear is extended. In such a case, it may be permissible to exceed V_{LO} and accelerate to V_{LE}, the maximum landing-gear-extended speed. Protecting the doors during gear retraction also requires being at or below V_{LO}.

The rest of the most frequently used V-speeds are used when operating multi-engine airplanes. V_{MC}, for example, is the minimum-controllable airspeed with the critical engine inoperative. (The critical engine is the one that, upon failing, has the most adverse effect on directional controllability and—assuming clock-wise-rotating properties—is the engine located farthest outboard on the left side of the aircraft.)

An engine failure in other than center-line-thrust aircraft (such as the Cessna 336/337 Skymaster) results in a strong yawing moment created by the thrust on one side of the aircraft and the drag of a windmilling propeller

on the other. Directional control is maintained by countering this asymmetrical condition with rudder (in the direction of the operative engine). If airspeed is reduced, however, the rudder loses effectiveness. If airspeed is allowed to decrease below V_{MC}, even full rudder cannot prevent a yaw toward the dead engine.

It is extremely dangerous to fly a multi-engine airplane at or below V_{MC}—especially during the takeoff phase. V_{MC} is usually only 10 to 15 knots higher than a light twin's stall speeds. A pilot who climbs out at or below V_{MC} will face an uncontrollable yaw in the direction of a failed engine. If airspeed is allowed to dissipate, this yawing can be accompanied by a stall. And this stall will be asymmetric. The slower-moving wing—the one with the failed engine—will stall first, and the thrust of the operating engine can make the airplane enter a spin. The severity of these reactions is much more pronounced when the failed engine is the critical engine.

V_{MC} usually is determined with the critical engine inoperative (and its propeller windmilling) and the remaining engine(s) producing takeoff power. Also, the flaps are in the takeoff position, the landing gear is up, and the cowl flaps are open. The aircraft must be out of ground effect, banked no more than five degrees (toward the operative engine) and be loaded to the maximum-allowable takeoff weight at the aft CG limit.

V_{MC} obviously is not a constant. It can be reduced by moving the CG forward, feathering the propeller of the inoperative engine (to reduce drag on that side of the aircraft) and reducing engine power on the opposite side.

V_{MC} as applied to light and medium twins is more correctly termed V_{MCA} because it refers to an airborne situation. V_{MCG} is the minimum speed necessary to maintain directional control of Transport-category aircraft following an engine failure during the takeoff roll (while on the ground).

V_{YSE} and V_{XSE} (the SE stands for single engine) are the speeds for best rate and angle of climb with the critical engine inoperative and apply only to Normal-category twins. They are used in the same manner as V_Y and V_X and vary with altitude and gross weight. V_1 and V_2 are terms applicable to Transport-category multies, although they are sometimes applied erroneously to light twins. V_1 is the takeoff decision speed and is the speed below which an engine could fail and the airplane could be safely stopped on the runway. An engine failure at a speed greater than V_1 mandates that a pilot continue the takeoff roll with available power and accelerate to V_R. It would be unwise to abort after V_1 because there may be insufficient runway to stop the airplane. After rotation, the aircraft should continue accelerating to V_2, the takeoff safety speed, which should be attained at approximately 35 feet agl.

Nailing The Numbers

Pilots occasionally violate limiting airspeeds without realizing it.

The concept of V_1 does not apply to most propeller-driven twins because they cannot continue a takeoff roll and accelerate on one engine. The pilot has no choice but to abort even if this means overrunning the end of the runway—unless the aircraft has reached V_{SSE}, the safe single-engine speed. Although V_{SSE} is not addressed in certification requirements, the concept was developed by airframe manufacturers to establish a minimum speed (above V_{MC}) at which a proficient pilot could expect to be able to lift off, "clean up" the aircraft and climb. (There is no guarantee how well the aircraft will climb, however).

Although pilots usually are careful not to violate limiting airspeeds, they occasionally do so without realizing it. This is because airspeed-indicating systems are not particularly accurate (especially when an aircraft is more than a few years old). Moisture and other contaminants entering the aircraft's pitot-static system render airspeed indicators inaccurate.

This should come as no surprise to those who fly twins with dual airspeed indicators. Rarely do the two instruments agree within five knots; discrepancies of 10 knots are not rare. (Most pilots have an unfounded bias toward believing the gauge on the left side of the instrument panel.) Those who practice formation flying also recognize that the airspeed indicators of different aircraft seldom agree.

Although FAR 91.171 requires the static pressure system and altimeter of any aircraft to be flown under instrument flight rules to be checked for accuracy within the previous 24 calendar months, no such requirement exists for the pitot pressure system or the airspeed indicators. Those who would like to justify their faith in airspeed indicators might consider a biennial test of the pitot pressure system at a local instrument shop. If necessary, an airspeed calibration card will be prepared for the aircraft. After all, a pilot can fly by the numbers only if the numbers he reads are accurate.

Barry Schiff, AOPA 1803, is an airline captain and CFII who has flown 200 types of aircraft and holds eight world records for speed and altitude.

MONTHLY WRITING AWARD

THREAT

Captain Al Holder
Threat Branch
Directorate of Combat Developments
U.S. Army Aviation Center
Fort Rucker, AL

Spetsnaz is the elite special operations forces subordinate to Soviet military intelligence. Its mission, although quite varied, is to destroy everything and everyone that pose a threat. This article reveals just how unique Spetsnaz is and its threat to Army Aviation.

SPETSNATZ
THE HIDDEN ENEMY

CAPTAIN MIKE PRESKETT had just finished a quick inspection of his company. They were occupying their local deployment area (LDA) and had established a hasty perimeter. He was satisfied with the company's position. Preskett had no illusions that his position was unknown to any potential aggressors. After all, they had used the same LDA for the past 21 months. Just the same, any aggressors wanting this piece of Germany would not catch his unit unprepared.

This alert was different. Preskett was notified around 2000 hours yesterday evening instead of the usual 0-dark thirty. The S3 said to forget about any specific time gates, just occupy the LDA prior to

daylight and be prepared to road march to battle positions. Not long afterward, Preskett received authorization to break into his basic load, and the community began implementing the noncombatant evacuation plan.

The troops sensed the urgency and tension, and their actions affected Captain Preskett in a way he had not anticipated. They established their positions quietly and resolutely, then began checking and rechecking their weapons and gear. The young noncommissioned officers were particularly active and resourceful. Whatever doubts Preskett had of his unit's combat readiness were gradually replaced by a sense of pride. He realized that the key element in this battle would be, as always, the human factor, and he rededicated himself to his soldiers' welfare.

But some things were going wrong. Division lost communications with corps for 3 precious hours during the alert sequence. One of the counterpart companies had been diverted from its LDA to secure a nearby ammunition storage point (ASP) after a similar ASP farther south had been attacked, and there were rumors of some units in the division being attacked by an unidentified terrorist organization.

What Captain Preskett did not realize was that his division, indeed all of North Atlantic Treaty Organization (NATO), was already the subject of an aggressive attack. Key command and control facilities, logistical centers, bridges and vulnerable combat units were under attack by small teams of well-trained and skilled professional soldiers who were determined that NATO would not transition from garrison to war unopposed.

Bridges along the division's route of march from garrison to initial battle positions had been destroyed. The result was that while most of the maneuver battalions were able to proceed east, division artillery (DIVARTY), the air defense artillery battalion and the engineers were delayed for what would probably be 10 hours.

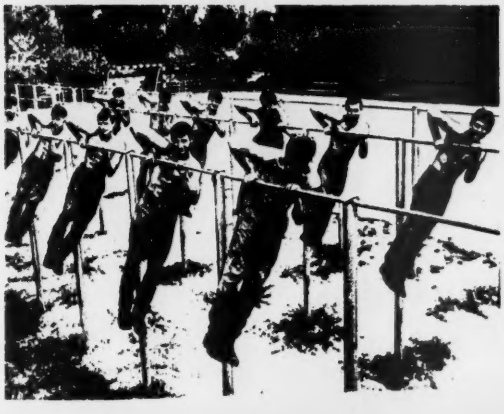
Some units had been directly attacked before they could be organized for combat. Most dramatically, the Aviation battalion had been all but destroyed. The division's helicopters, neatly lined up and concentrated on parking ramps without the benefit of revetments, were attacked by 6 to 12 sappers. The aircraft not destroyed by explosives and shrapnel were machine-gunned. The attackers did not employ a hit-and-run tactic — they came to destroy and did not withdraw until the entire airfield was burning.

Duty personnel organized to prevent vandalism and random, unauthorized access were not prepared for an aggressive and coordinated attack. Six guards were killed. A similar attack was conducted against DIVARTY, except the targets were prime movers and ammunition carriers.

In the first critical 24 hours of war, Captain Preskett's division was already limping and, in a few discreet safe houses, team leaders of an elite Russian special operation force, known generically as Spetsnaz, met to congratulate themselves and plan their next missions.

Naval Spetsnaz team member.

Physical training in Spetsnaz units stresses endurance and confidence building.



The Spetsnaz soldier is highly motivated and above average in mental and physical capabilities.

Long range patrolling.

So who are the Spetsnaz? What is their mission? What threat do they pose to U. S. forces in general and to Army Aviation in particular? An honest assessment of our capability to fight in Europe has to address this often overlooked dimension of high intensity warfare.

Spetsnaz is the name given to certain special operations forces subordinate to Soviet military intelligence, or GRU. A Soviet Army can be expected to have one company-sized unit of Spetsnaz forces under the control of its intelligence staff, and a Front would have a brigade. Additionally, there are independent Spetsnaz regiments retained under the control of the GRU Central Apparatus of the Soviet General Staff. The Soviet navy also maintains a Spetsnaz force, sometimes known as combat swimmers. This organization is equipped with such sophisticated hardware as midget submarines. Their prime mission appears to be disruption of ports, harbors and other naval facilities. The total Spetsnaz strength has been estimated at between 27,000 and 30,000, with more than half under the direct control of the GRU Central Apparatus.

In addition to the Spetsnaz "combat" units, the GRU maintains an active agent network in foreign countries. The function of these networks is to gather intelligence and identify potential sabotage targets. These agents maintain safe houses stocked with provisions and could provide a supporting infrastructure for various Spetsnaz combat operations.

Prior to hostilities, Spetsnaz units organic to Armies or Fronts could be air dropped behind enemy lines (or infiltrated in any number of ways), link up with the agent network already in place and conduct combat operations. A U. S. division commander in Europe could consider his area of operations infested by an agent network controlled by the GRU, and, in the event of war, a company-sized element of Spetsnaz forces could be targeted against him.

Any attempt to describe the kind of missions a Spetsnaz force might consider runs the risk of omitting something. Their training indicates they perceive as a part of their mission assassinating an opposing force's military and political leadership; destroying an enemy's nuclear delivery means; destroying key facilities such as airfields, ports, logistical centers, C^3 (command, control and communications) networks and air defense systems; and any other activity which might give the Soviet forces an advantage.

The GRU selects only the highest qualified conscripts for service in Spetsnaz organizations. The screening begins even before the candidates are inducted. The primary discriminators are political loyalty and physical and mental fitness. The GRU skims off the very best recruits, even at the expense of other elite forces such as airborne, strategic air defense forces and nuclear submarine forces. World-class athletes are often recruited for service in foreign

Spetsnaz forces undergo intensive hand-to-hand combat training.

Soviet high performance parachute of the type that could be used by Spetsnaz forces.

areas and usually receive commissioned ranks.

Once in a unit, the Spetsnaz soldier will spend about half his time in the field. Spetsnaz training is as realistic as peacetime limitations permit and is conducted in an atmosphere of stiff competition. Training exercises include long, forced marches of 1,000 kilometers or more without the benefit of logistical support or transportation while interior forces and KGB troops search for them. Spetsnaz forces often conduct mock attacks against government and military objectives, a practice which not only sharpens their skills but indicates the breadth of targets they consider.

Spetsnaz units are rank-heavy and initiative is considered an essential leadership quality. Training is demanding, and competition for leadership positions is intense. The best recruits are selected for sergeant's training, and only the best sergeants are given leadership positions. The Soviets perceive that these forces will operate independently and will have to rely on their own resourcefulness once behind enemy lines.

In prioritization of targets, vulnerability would seem to be a key determinant. Vulnerability can be considered from two perspectives: the degree of physical security provided for a potential target; and, the intrinsic "hardness" of the target itself. This is especially significant to Army Aviation. Helicopters are easily disabled, usually concentrated at one airfield and inadequately protected. Soviet planners have a healthy respect for the force multiplier effect of Army Aviation, and this should also influence prioritization. In short, the combination of vulnerability factors and combat potential would seem to place Army Aviation high on a Spetsnaz target list.

Army Aviation should, therefore, feel particularly sensitive to the Spetsnaz threat, especially with regard to airfield security. An airfield secured with nothing more than a single, unlit chain link fence and a half-dozen roaming guards is vulnerable. Some relatively inexpensive countermeasures might include double chain link with lights and guard posts that allow observation of the perimeter, augmented by a reaction force with preplanned positions. Of course, no one solution exists that would apply to every Army airfield, and any solution would have to take into consideration the real-world factors of expense, available resources and unit mission. Acceptance of a vulnerability, however, should not be an option.

The probability of a Spetsnaz attack succeeding decreases exponentially as surprise decreases. Awareness is therefore a critical deterrent. Awareness is enhanced by accurate and timely intelligence (especially human intelligence), good operational security training and an effective alert system. There is, however, an aspect of this threat that is attitudinal. We must *accept* the fact that *this threat exists* and that it can substantially reduce our combat capability if we do not take *steps to counter it.*

It has been 3 weeks since the alert. Preskett's company departed their LDA just after dawn and road marched to their initial battle positions. He changed battle positions three times in the first 2 days. Seventy-two hours after the alert, in the midst of tense speculation, several terrorist groups claimed credit for the series of attacks against U. S. and other NATO military facilities. Five days later, Preskett brought his unit back to garrison.

The damage done to the division was numbing. Five days in battle positions gave commanders time to consider how they would fight armored columns without the benefit of attack helicopters and reduced artillery fire support. Throughout the division, commanders and their staffs were reviewing their war plans with a new emphasis on security.

This article is the third of a five-part series about the AH-64 Apache combat mission simulator. Part I, in the March issue, introduced the battleground. Last month Part II covered the weapons systems. Watch for "Part IV, Instructional Features" and "Part V, The Future" in later issues. Anyone desiring copies of Parts I and II can obtain them by writing to Editor, *Aviation Digest,* P.O. Box 699, Ft. Rucker, AL 36362-5000, or by calling AUTOVON 558-6680.

Kill or be Killed

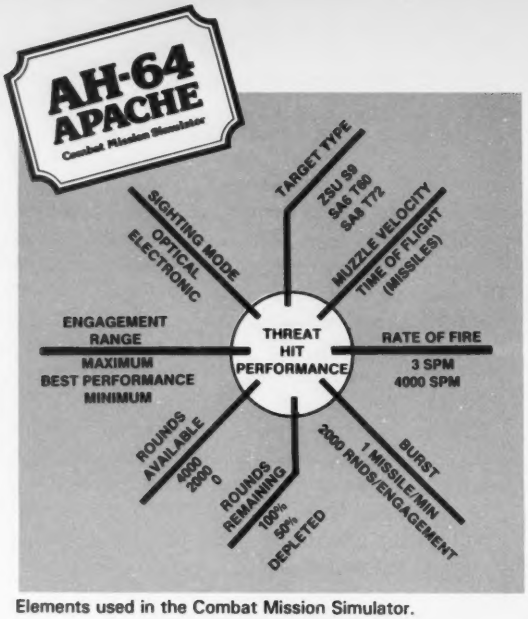
Part III, The Tactical Threat Algorithm

IN THE SUMMER of 1981, AH-64 Apache pilots and gunners gained firsthand knowledge about Apache performance against a realistic threat. During AH-64 operational test (OT) II at Ft. Hunter Liggett, CA, Apache crews fought a fully instrumented red force of armor and antiaircraft threat systems which employed actual Soviet tactics in combat scenarios. (See "AH-64 and OT II" in the January 1985 issue.)

Lessons learned about the threat's tactics, lethality, acquisition probability, hit probability, and the effects that meteorological, avionic and crew operational variables had on the success or defeat of the mission proved to be invaluable. The training received by test participants, a once in a lifetime opportunity, now will become routine for all Apache pilots because of the AH-64 combat mission simulator (CMS).

CMS trained crews will experience being shot down, will fight in all types of weather conditions and will fire threat-destroying weapons. The threat in the CMS thinks, fights, and given the opportunity, kills the Apache. Previous articles in this series have introduced the battleground and the simulation of Apache mission and weapon systems. The subject of this article is the programing of the CMS threat to acquire and destroy the Apache when the crew makes an incorrect tactical decision.

CW4 William Yarlett
Office of the Project Manager for Training Devices
Naval Training Center
Orlando, FL



Elements used in the Combat Mission Simulator.

The quasi-intelligent threat is controlled by the master tactics computer, which solves equations resident in a tactical threat algorithm to determine the moment a threat system acquires the Apache.

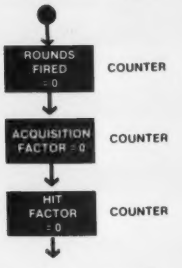
The purpose of this computer is to compute instantaneously threat capabilities or lack of capability, probabilities of acquisition and probabilities of hit against the ownship helicopter. Data stored in modifiable lookup tables for each threat and used in the algorithm include:

- Threat basic ammunition load
- Rate of fire
- Rounds fired per engagement
- Muzzle velocity
- Engagement range
- Acquisition range
- Acquisition decay due to reduced visibility
- Effect on acquisition due to the use of backdrop terrain
- Effect on acquisition attributable to height above mask of ownship
- Effect on acquisition due to the use of aircraft survivability equipment (ASE).

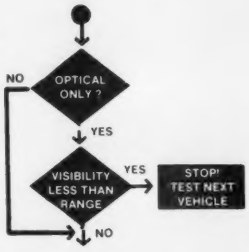
The instructor activates the automatic target intelligence feature by inputting a threat lethality factor, one of 10 levels of difficulty, which are used to vary the threat's effectiveness to match the pilot's and gunner's proficiency level. The instructor also selects one of 15 preprogramed threat force scenarios or has the capability to manually build his own. Scenario selection is made through the instructor control feature called target engagement exercise or TEE.

The TEE establishes target types, quantity, location, movement, speed, route of travel and hostile status. Using the TEE, the instructor selects the parameters for the threat to acquire the Apache.Selectable parameters include ownship Apache altitude, exposure time, range from threat or release of ownship weapon.

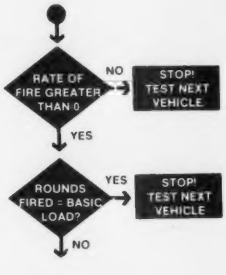
When a scenario begins, the threat algorithm keeps track of the rounds fired by each vehicle, the acquisition probability and the hit probability. As long as the acquisition probability is less than the instructor selected lethality factor, the algorithm will cease interrogating this vehicle and will proceed to the next threat vehicle. The interrogation process goes on many times per second in the computer providing a "real-time" update. The moment any threat acquires the ownship, the engagement process begins. Just how the engagement and hit probability is determined will be explained later in the article.

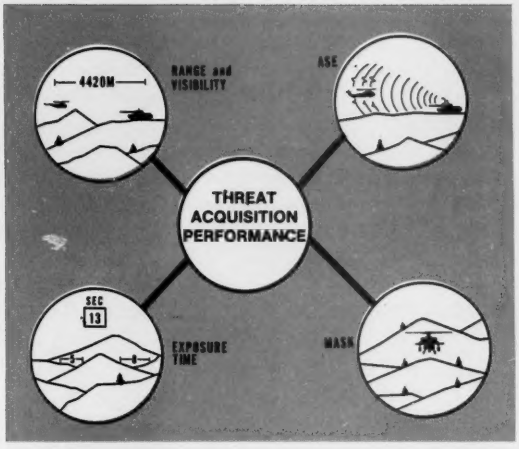


The next acquisition computation compares the meteorological visibility to the threat-to-Apache range. This information is needed to determine the acquisition probability of optical-only threat systems.



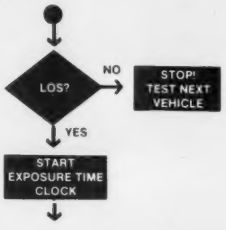
The algorithm then tests all vehicles to determine if they have a shootdown capability. The threat helicopters and trucks simulated have not been designed to shoot at the Apache and thus the algorithm ignores them. Threat systems that can shoot at the Apache are then tested for a depleted basic load because threats begin each scenario with a complete basic load. As a result of engaging the Apache, threat systems can run out of ammunition.





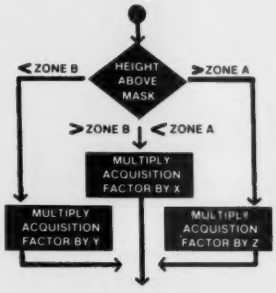
Acquisition elements.

Two additional CMS computers constantly determine the line-of-sight (LOS) between the Apache and all threat vehicles. This information is required input to the threat algorithm and is used in the acquisition equation as ownship exposure time. Buffers are used to avoid inconsequential breaks in LOS in order to accurately record line-of-site events. Exposure time is the first factor used in the acquisition equation. Should the minimum exposure time value contained in the threat table not be achieved, the acquisition event is terminated.

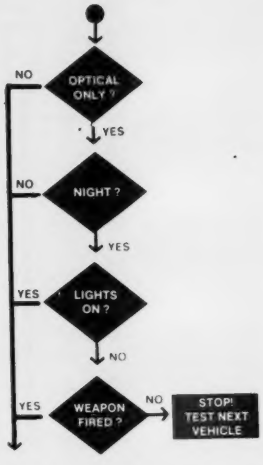


The second value factored into the acquisition equation is ownship-to-threat range. Maximum acquisition range values are contained in the threat lookup table, and when exceeded the acquisition event computation is terminated. While acquisition range values are being factored, hit probability range values also are being computed for use in the hit probability equation. Should a threat satisfy the acquisition requirements but be located beyond its maximum engagement range, the threat will "continue to march" until the Apache is within weapon's range and then shoot to kill.

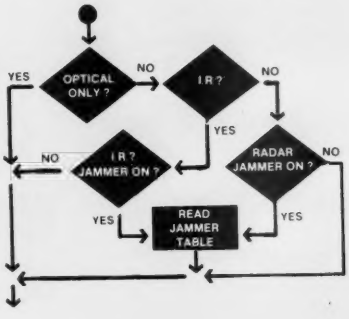
The third factor used in the acquisition probability equation is the ownship height above mask. The higher the ownship unmasks, the greater its probability of being acquired and hit. The rate at which the probability increases is affected still further by the existence of background terrain, which adds to the acquisition probability when nonexistent, and the ownship is sky lighted versus lowering the probability when not sky lighted.



On night missions with aircraft lighting off, the Apache is not acquired by optical-only threats until it engages a threat with one of its weapon systems. The ownship is subject to normal daylight threat acquisitions if the crew fails to turn off the exterior helicopter lights.



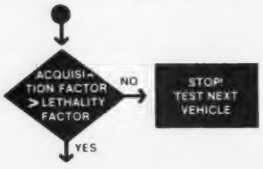
Another important factor used in the acquisition and hit equations for the applicable threat systems is the activation of ASE available to the Apache crew—the radar warning receiver, radar and infrared jammers and chaff. The classified effectivity of these systems is played to the counter-countermeasures level.



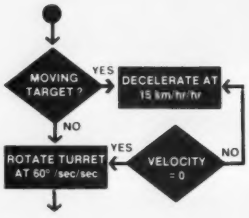
Following the accumulation of data for exposure time.

M-1 Abrams tank as seen in the AH-64 CMS.

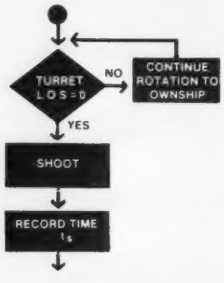
range, height above mask, backdrop terrain usage and ASE use and assuming visibility, ammunition or darkness have not prevented the computer from reaching this point in the equation, the results are now compared to the instructor selected lethality threshold.



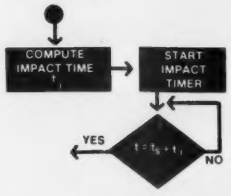
When the results are less than the lethality threshold, the computer stores the data on that threat and moves on to test the next threat. Once the results exceed the threshold, the turret or launcher of the associated threat vehicle is instructed to rotate toward the Apache. If the threat is moving at this time, it is commanded to first stop and then orient its weapon system.



Once the threat's weapon is coincident with its line-of-sight to the Apache, it is directed to shoot the number of rounds annotated for that threat in the threat lookup table. The rate of fire and the time between each group of shots is also in the table, and these factors are applied to all subsequent shots. If the theat is within the Apache crew's field of view, the crew will observe the muzzle flash or signature of the threat missile launching, whichever is appropriate.

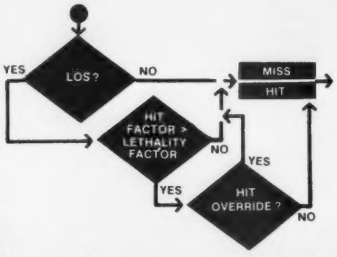


The algorithm, using weapons data from the look-up table, computes the impact time of the round(s) fired and at the resultant impact time will direct the visual, motion and aural systems of CMS to simulate either a hit of the Apache or a near miss. The determination is based upon the three factors of line-of-sight, lethality threshold and instructor inhibits (hit override) which are described below.



- Line-of-sight—If ownship has remasked since the round was fired, the computer will direct a near miss.
- Lethality threshold—If the hit probability is less than the lethality threshold factor, the computer will direct a near miss.
- HIT Override—If the instructor has this feature activated, the computer will direct a near miss.

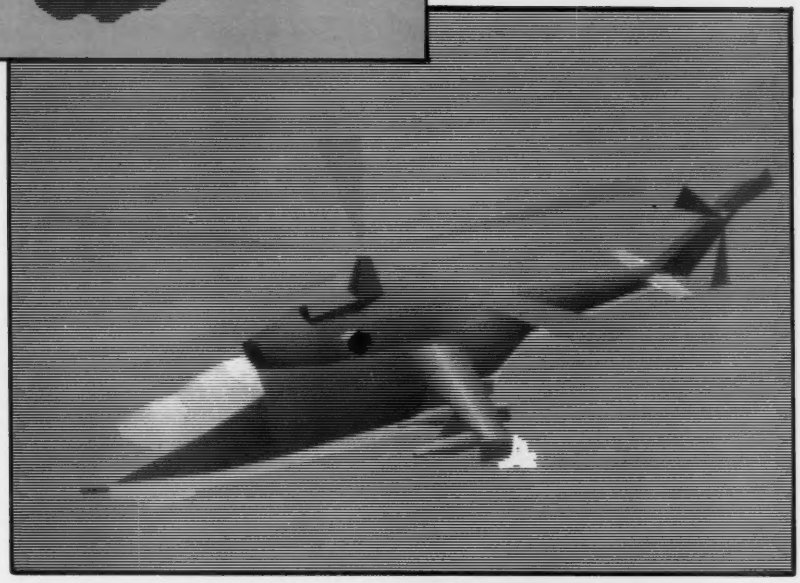
The near miss is displayed along the line-of-sight of the threat in close enough proximity to the Apache so that it will definitely get the crew's attention.



If all three of the above factors are false, the threat round will impact the Apache. The impact will affect visual, motion and aural subsystems of the CMS commensurate with and proportionate to the type and size of the impacting round. Each threat weapon impact will result in the automatic insertion of an instructor preselected malfunction ranging in complexity from simple to catastrophic. Under these circumstances, the simulator will *not* freeze thus forcing the pilot to abort the mission and return to the base or perform a forced landing as appropriate.

Once the line-of-sight is broken by the crew remasking, the threat will automatically return the launcher or

ZSU-23-4 as seen in the AH-64 CMS.



Mi-24 Hind as seen in the AH-64 Combat Mission Simulator.

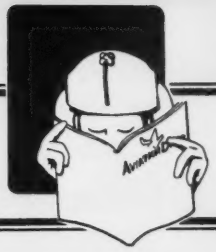
turret to the forward position. If the threat was a moving target it will accelerate to its previously programed speed and proceed along its programed pathway.

Any time a satisfactory acquisition event is completed, whether the threat fired upon the Apache or not, the event is recorded on the threat scoring page at the instructor station. This page displays each event with line-of-sight start time and stop time, total exposure time, time since last exposure, acquisition and hit probabilities, range from ownship, ownship height above mask, ownship use of terrain background and crew use of ASE equipment. The computer can track this information for as many as 99 different events.

The threat in the AH-64 CMS is quasi-intelligent. It wants to survive as much as the Apache crew fighting it does. It is programed to be systematic and unforgiving.

Systematic and unforgiving, the philosophy of many a realworld threat. The AH-64 CMS is a high fidelity training device — a one of a kind tool to train Apache aviators in a high threat environment never before available and under conditions as close to the real thing as any attack helicopter crew has ever before experienced. An experience that must result in being trained to kill...or be killed.

VIEWS FROM READERS



Editor:

The article on "Aviation Employment in Defensive Operations" was excellent. We'd appreciate it if you could forward us the two previous articles, "Special Purpose Operations" and "Offensive Operations."

CPT(P) Russell J. Goehring
Ft. Leavenworth, KS

Editor:

I would like to enlist the help of your readers in regard to anyone that might have a tape recording of combat flying during an assault on an LZ in Vietnam. What would be perfect is a recording off of the interphone that would have crew voices plus radio communications with the gun ships and lift ships.

The purpose of this recording is to make the Sunday airshow at the Oshkosh EAA convention as real as possible. The EAA and the Warbirds of America are planning a special salute to the Vietnam era veterans during the Sunday, 28 July, airshow. We are in the planning stage of this show and have been promised participation by the Wisconsin Army Guard. We hope to put on a realistic show that would include four Cobras and eight Huey lift ships.

We try to make these airshows more of a history lesson than just a lot of aircraft flying by. With this in mind, a recording of this type would add a special touch. If this is not possible from one of your readers, would there be a possibility of recording something like this from an Army film taken during that time?

Any help in regards to this would be appreciated.

Walt Troyer
Airshow Announcer
P.O. Box 61
Sun Prairie, WI 53590
608-837-8392

Editor:

As a graduate of the Fixed Wing Class 69-10 in July of 1969, and a veteran of the Vietnam conflict, I have some very special memories about the 0-1 Bird Dog (previously designated L-19).

It is my desire to put together a national or international association of Bird Dog enthusiasts. The project is progressing, but I can find precious little written about this tough little Cessna.

I can't begin to tell you how important this project is, and can be. It is our goal to promote the history of the Bird Dog and build data on the pilots and support staff involved with the 0-1 as well as their units.

Also, we will be acquiring, restoring and flying as many Bird Dogs as we can locate within our budget. Any information we can get our hands on for our reference files would be most helpful. Plese send any information about the Bird Dog to me at the address below.

Phil Phillips Jr.
3939 San Pedro NE, C-8
Albuquerque, NM 87110

Editor:

Please send copies of the following *Aviation Digest* articles to the address below:

"Training the Aviation Warrant and Commissioned Officers," March 1984.

"Aviation Officer Basic Course," "Warrant Officer Candidate Military Development Course," April 1984.

"The Officer/Warrant Officer Rotary Wing Aviator Course," May 1984.

Sheri L. Tonner
Grand Forks, ND

Articles from the Aviation Digest requested in these letters have been mailed. Readers can obtain copies of material printed in any issue by writing to: Editor, U.S. Army Aviation Digest, P.O. Box 699, Ft. Rucker, AL 36362-5000.

U.S. Army Class A Aviation Flight Mishaps

	Number	Flying Hours (estimated)	Rate	Fatalities	Total Cost (in millions)
FY 84 (to 26 April)	22	837,600	2.63	21	41.2
FY 85 (to 26 April)	30	827,698	3.62	27	55.6

Flying In and Out of Controlled Zones

THERE ARE numerous symbols on an aeronautical chart. For the visual flight rules (VFR) only pilot, the symbolic representation for a control zone causes much confusion. In fact, many pilots will avoid penetrating the dashed-line perimeter of the zone rather than risk breaking a rule or endangering their safety.

The control zone has no significance except to remind you that instrument flight rules (IFR) traffic may be operating in the vicinity and air traffic control (ATC) advisories are available upon request. Conrol zones are normally a circular area within a radius of 5 statute miles with extensions necessary to include instrument approach and departure paths. Control zones rise from the surface up to the base of the continental controlled area. Control zones that do not underlie the continental controlled area have no upper limit. They are in continuous existence, unless otherwise noted on sectional charts and in the Airport/Facility Directory. Aerobatics are not permitted within control zones. The controlling authority is an operating tower or the appropriate ATC center. During instrument meteorological conditions these zones are reserved exclusively for the use of traffic operating on an IFR flight plan or on a special VFR (SVFR) clearance.

Otherwise, as noted above, the control zone demarcation can be ignored by pilots when VFR weather minimums for controlled airspace can be maintained. One exception is ultralight operations which need prior permission to operate in a control zone. VFR pilots must be concerned during marginal weather about control zone penetration. Under these conditions, contact with the tower is not necessary; however, basic VFR minimums must be maintained (FAR 91.105). Radio contact must be made with the tower, when flying in an airport traffic area: below 3,000 feet AGL and within 5 miles of an airport. VFR aircraft cannot enter the zone when weather minimums are below VFR without an appropriate clearance from ATC. The ceiling is always determined by the certified weather observer for the conrol zone and applies to all airports located within the zone.

When weather is less than VFR, pilots may request a "special VFR clearance" from the controlling ATC facility. Airports identified on sectionals by "T" marks within the segmented perimeter do not permit fixed wing SVFR clearance. Controller workload permitting, SVFR clearance will be granted whenever this will not delay IFR traffic. SVFR aircraft will be provided separation from IFR traffic, given vectors or instructed to make position reports. Under SVFR conditions at night, pilots and aircraft must meet the requirements for instrument flight conditions.

SVFR flights should not be taken lightly by pilots who have little or no instrument experience or have never flown without reference to the ground. SVFR clearances do not authorize flight into clouds regardless of the pilot's rating/qualification. Holes in clouds, which pilots tend to fly through, frequently close up instantly, requiring complete dependence on instruments and ATC vectors. Often, instrument rated pilots have become lost, disoriented and crashed.

SVFR departures for VFR-on-top operations over reported cloud cover have a way of turning into long flights over extensive cloud layers. This may lead to eventual fuel shortages or perhaps malfunctions forcing a descent through or into clouds, and the situation may worsen due to icing conditions and thunderstorms.

Special VFR accidents are few; however, most are fatal.

Your longevity/flying career depends a lot on your knowledge of the system.

For additional information or clarification, contact Mr. Robert C. Cole, AUTOVON 284-7796/6304, Commercial (202)274-7796/6304.

Readers are encouraged to address matters concerning air traffic control to: Director, USAATCA Aeronautical Services Office, Cameron Station, Alexandria, VA 22304-5050.

painting by Robert C. Sherry

Your individual contribution of $100 entitles you to receive a set of 12 reproduced paintings of Army aircraft signed by the artists; and you also will become a life-time member of the Museum Foundation.